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SURGICAL TREATMENT OF GOITER [1]

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THE choice of treatment in any condition must be based upon the conviction of the physician that he is utilizing or referring his patient for the utilization of whatever method will secure the best immediate and remote results at the minimum economic loss to the patient. The responsibility for the results rests on the operator, be he surgeon or radiologist or whatever, who must constantly compare his methods and end-results with other methods and their end-results. Such a symposium as this, therefore, is of the utmost value, as it makes it possible for us to weigh the evidence for and against different methods of treatment. As the result of such a symposium each of us must be either more entrenched in his present position or must acquire a reasonable doubt of the wisdom therefor, which will lead him to further investigation until his point of view is again clarified.

It is not surprising that various methods of treatment have been suggested for the syndrome which we designate as hyperthyroidism. There has been so much uncertainty regarding the cause of this condition and the specific nature of this disease itself that the problem has been uncertain and the solution of the problem correspondingly indefinite. Among definite methods of treatment which have been proposed for this condition, however, the only three which merit our serious discussion are the rest cure, radiation and surgery.

[1] Presented before the Radiological Society of North America, at Cleveland, December, 1925.

Ever since the therapeutic value of the X-ray was discovered the possibility of its application to the treatment of hyperthyroidism has been under discussion, and during recent years the literature pertaining to this subject has mounted to astonishing proportions. For ourselves, we have been watching the literature constantly to discover whether or not radiation appears to be offering more for the patient with hyperthyroidism than can be offered by our plan of management.

According to Means and Aub, "the chance for cure of exophthalmic goiter is as good with roentgen ray as with surgery in groups of equal toxicity. This being true, the former method is preferable, for the danger of fatal outcome is less." It is claimed that the X-ray produces no scar, does not interfere with the patient's occupation, is painless and causes very little inconvenience to the patient. As against these claims, we have found under the plan of management employed by us that almost no case of hyperthyroidism is too severe to warrant surgical treatment. As for the mortality rate — during a period of six months from June 1, 1925, among 748 thyroidectomies for hyperthyroidism the mortality was 0.82 per cent, and among 398 ligations the mortality was 0.76 per cent. By careful choice of the location of the line of incision the resultant scar is so slight that within a few weeks it is practically invisible. The one or two brief stays in the hospital do not inconvenience the patient more than the repeated visits to the

hospital for treatment with the X-ray, and as for the final point raised by the proponents of the X-ray treatment, *viz.*, that the patient's occupation is not interfered with, we would reply that in the case of acute hyperthyroidism, it should be interfered with and for a sufficient period of time, whatever method for diminishing the substance of the gland is employed. The problem of both X-ray and surgery being to diminish the toxic secretions of the gland by diminishing the amount of the secreting substance, it appears to us that surgery supplies the one method by which the amount of diminution can be definitely controlled. The amount of reduction of the gland by radiation cannot be measured accurately. The argument of the radiologist that if X-ray fails surgery can be employed later fails in one respect, for the difficulties of operation are increased by radiation, and during the period of radiation the disease has wrought additional damage.

The success of any plan of treatment, and this applies to radiation as much as to surgery, must depend not only upon the method employed but also upon the plan of management of the patient over a period of time which varies according to the type of the disease which is under treatment. In the case of hyperthyroidism, the management of the patient over prolonged periods is of peculiar importance. According to our conception, the operation represents but one stage in the patient's progress to recovery. The surgeon himself, while he is the controlling factor, is but one of many factors, each of which has its effect upon the outcome. It would seem worth while, therefore, to outline briefly the plan of management which we have adopted, the value of which we believe to be attested by the figures given above.

The outstanding feature of this disease, that is, the hypersensitiveness of the patient to every form of stimulation, is borne in mind continually by everyone who comes in contact with the patient from the day he enters the consulting room to his discharge from the hospital. An effort is made also to follow him to his home by explicit directions regarding the routine which should be followed. As we have come to see that in hyperthyroidism the system as a whole has become affected, during his first days in the hospital the patient is subjected to a rigid examination to discover the condition of the kidneys and of the heart. These patients are always dehydrated to some degree and the acid-alkali balance is correspondingly disturbed; therefore, water is administered by hypodermoclysis, 2,000 c.c. of normal saline solution to which, in accordance with Bartlett's method, 1/32 per cent novocain has been added, being given once or twice a day. If the patient is very excitable and it is difficult to secure adequate rest, 1/6 of a grain of morphine is added to the infusion. If there is evidence of a weakened myocardium it is strengthened by the administration of digitalis, 2 c.c. every four hours for from four to six doses, this being followed by the administration of 20 minims twice a day.

The environment of the patient is strictly controlled, both the resident and nursing staff being specially instructed regarding the requirements of this type of patient.

In case of delirium, blood transfusion is often effective, the patient sometimes becoming rational immediately thereafter. It is needless to say that the delirious patient presents the gravest operative risk with which we have to deal, and in such a case the operation is postponed for at least two months.

The pre-operative use of iodine which is advocated by the Mayo Clinic, and is a logical sequence to the work of Marine and Lenhart, who were the first to establish the direct relation of iodine to the different types of goiter, has proved to be of considerable value in those cases of hyperthyroidism in which the enlargement of the thyroid is a true hyperplasia. Since we have been employing this solution we have been able in many cases to dispense with the preliminary ligations. When Lugol's solution is used, it is essential that the time of operation be carefully chosen in order

that the period of maximum improvement may extend throughout the first post-operative days, for it is a peculiar feature of the treatment that repeated courses are ineffective. For this reason the operation is performed from five to seven days after the treatment is started, as the maximum effect is usually reached at the end of the tenth day. During this period 1 c.c. of the solution is administered three times a day.

In order to minimize the excitement incident to the operation itself, the operation is performed in the patient's room without moving him from his bed, and, as a further precaution, the anesthetic—always nitrous oxid oxygen—is never allowed to pass beyond the stage of analgesia. In certain cases it is found best not to perform the two lobectomies on the same day but to separate them by a period of twenty-four hours, packing the wound open with flavine gauze, as by this means the wound can be kept *in statu quo* for this period, the surgeon literally beginning his work on the second day where it was discontinued the day before.

To promote rest and quiet, from one and one-half to three grains of luminal are given daily during the pre-operative period, and sedatives are used as the condition of the patient may indicate during the post-operative period. We have found that by this plan of management the majority of our patients may leave the hospital in not more than a week after the lobectomy has been performed. As stated above, each patient takes with him a list of dietary and general directions for his guidance during the post-operative period.

It may be well to add a word in specific reply to certain questions in which the members of this Society have expressed especial interest.

"Is the diagnosis of hyperthyroidism a sufficient indication for treatment?" We believe that it is, with the exception of the occasional case in which the hyperthyroidism has followed an acute infection, and in certain induced cases, especially in children, in which the hyperthyroidism usually disappears with the discontinuation of the iodine treatment which caused it.

"Do the extremes of life contra-indicate hyperthyroidism?" In general, I would say they do not. We have removed the thyroid from children as young as seven years of age. In old people it may be that senile changes have progressed to a degree which eannot be met by any precautionary pre-operative measure. In such cases, of course, an operation would not be considered.

As for surgical treatment in the presence of "coincident chronic disease such as phthisis, diabetes, hypertension, and, in particular, heart disease," operation is not contra-indicated, but the plan of management must be adapted to the condition of the individual case.

As for the rôle of iodine and thyroid extract: The pre-operative use of Lugol's solution has been described. After operation we give routinely two grains of thyroid extract daily for the first two or three days. As "a curative measure *per se*," iodine is ineffective, and its pre-operative use has no influence upon the post-operative incidence of myxedema, against which the patient is protected, as stated above, by the post-operative administration of thyroid extract.

As I have stated above, we believe that at the present time, at least, surgery is the method of choice in the treatment of hyperthyroidism. It should be emphasized that the surgical treatment of hyperthyroidism includes not only the controlled accurate reduction of the gland but also a plan of management which takes into account the entire syndrome in the individual case.

INDICATIONS FOR SURGICAL TREATMENT OF GOITER [1]

By FRANK H. LAHEY, M.D., F.A.C.S., Boston, Mass.

THYROID surgery has in the past ten years been a subject of marked interest; as a consequence of which the widening of the field of operability, the resulting lowered mortality rate and improvement in results have made it, we believe, a field of surgery almost unrivaled in point of its ability to remove crippling, disabling and in many instances ultimately fatal burdens, and return patients so completely to health and activity.

Before proceeding directly to the subject of the indications for the surgical treatment of goiter, we wish to stress a point which is of the very greatest importance in dealing with goiter. That is, that the basis of all sound thyroid treatment is diagnosis, and that is based upon sound clinical judgment, an attainment which is acquired only by an extensive experience with thyroid states. There is no clinical situation, in our opinion, where it is so readily possible to go astray as in determining the presence or absence of thyroid toxicity. It may be so simple to demonstrate that no one could miss it, or, on the other hand, the demonstration of doubtful or borderline thyroidism associated with neurosis may and has in our experience taxed the clinical resources of the most experienced observers.

From the point of view of the indications for the surgical treatment of goiter, we would consider colloid goiter, adenomatous goiter multiple and single, cysts of the thyroid, malignant goiter, lingual goiter and toxic goiter.

Colloid goiter rarely requires surgical treatment. The instances in which it does are those where it is applied as a cosmetic measure because of an unsightly goiter or to remove a colloid goiter which is causing pressure. Colloid goiter occasionally descends into the mediastinum but rarely causes pressure as a result of its mediastinal prolongations. In our experience it has been practically the only type of goiter which has encircled the respiratory tube at the level of the larynx. The elongated upper poles of the colloid goiter are particularly prone to pass inward from either side behind the larynx, resulting in pressure on the back of the larynx, where that structure is unprotected by a rigid wall. We have observed marked stridor and respiratory difficulty from this type of goiter. In this group no intrathoracic masses and no denting or deviation of the trachea will be demonstrable, since the obstructing masses are behind the larynx and not readily visualized by X-ray.

Adenomata of the thyroid, discrete or multiple, should, in our opinion, be removed in all patients over thirty because of the danger of malignant degeneration in them. It has been our experience where malignancy has ruptured through the capsule of an adenoma and its distinguishing clinical features, such as stony hardness, firm fixation, and diffusion of outline are present, that the outlook for the cure from a surgical point of view is hopeless. In other words, when malignant degeneration of a thyroid adenoma is diagnosable, it is hopeless surgically. It is here that we have seen some of the very best results in a palliative way from X-ray treatment.

We urge the removal also of all adenomata causing any degree of pressure, as it has been our experience that denting and distortion of the contour of the trachea rarely lessens and usually increases. It is essential, then, that such adenomata be removed before they have so destroyed the resiliency of the tracheal rings that flattening, collapse or scabbard trachea result. We have observed all degrees of tracheal distortion and collapse and have at times been hard put to make a trachea with softened rings remain sufficiently open to admit the necessary amount of air.

[1] Read before the Radiological Society of North America, at Cleveland, December, 1925.

Intrathoracic, substernal or mediastinal goiters in theory would rarely, if ever, occur, were all adenomata which were low or tending to become intrathoracic removed at this stage of their development. A large number of very deeply situated intrathoracic goiters undoubtedly exist without symptoms for years. They frequently produce symptoms so late in life, after they have reached such extensive proportions in the thorax, that their removal is fraught with considerable danger. We feel, therefore, that every cystic goiter and every adenomatous goiter should be carefully X-rayed and investigated clinically as to the possibility of the existence of an intrathoracic or low lying tumor or cyst of the thyroid.

A great majority of the completely intrathoracic goiters, that is, with no goiter visible or demonstrable on the neck, consist of discrete adenomata or cysts of the thyroid which have migrated into the mediastinum and increased their diameters while located there. A very large number of the intrathoracic prolongations of partly intrathoracic goiters, that is, those with goiter evident upon the neck, are of the multiple colloid adenomatous type. Tracheal narrowing and tracheal deviation are very constant indications of the intrathoracic location of thyroid masses. A large number of the intrathoracic goiters are located either to one side or the other of the trachea, resulting in the deviation of that structure, usually in a curve corresponding to the more or less spherical outline of the adenomatous masses, the X-ray demonstration of which is of marked usefulness in the diagnosis of this condition.

X-rays will, as a rule, also demonstrate the change of contour in the flattened trachea. We have rarely seen intrathoracic goiter situated directly over the trachea and collapsing that structure anteroposteriorly. When such a condition, however, does occur, widening of the trachea as the result of the collapse may be demonstrated by X-rays taken in the anteroposterior plane, and flattening when the X-ray is taken through the lateral plane. The characteristic features of the X-ray picture of intrathoracic goiter, as we have seen it, have been the sharpness of outline of the intrathoracic mass due to the fact that the intrathoracic masses are usually symmetrical in shape, with a firm, fibrous capsule surrounding them. It should be a fixed rule, in our opinion, in any clinic dealing with thyroids in large numbers, that every nodular goiter be carefully X-rayed for the possible presence of an intrathoracic mass. All intrathoracic goiters are surgical and should be removed.

We have been amazed at times to note the depth to which intrathoracic masses could extend. We have repeatedly seen them run well behind the arch of the aorta, close to the very top of the heart. We have divided the manubrium but once and removed it but once in an operative experience of well over two hundred and fifty of these intrathoracic goiters. Care, however, must be exercised to protect the pleura, the thoracic duct, the trachea and the esophagus. The most serious consequence as the result of the removal of intrathoracic goiters has been mediastinitis. In the two cases in which this occurred, death resulted at the end of several weeks in spite of every measure instituted. Because of this danger and because of the shock and mechanical difficulties of extracting large tumors from the mediastinum, we urge their removal before they have become intrathoracic.

We wish to emphasize that we have several times been unable to demonstrate intrathoracic masses by X-ray, yet at the time of operation have found masses extending well down into the mediastinum. This, we believe, is one of the distinct advantages of operative procedure done on thyroids for other indications such as toxicity.

Cysts of the thyroid, in our opinion, should be removed when they are causing pressure, when they are intrathoracic in location, when they are unsightly, and also because of the danger of malignant degeneration. One thinks of cysts of the thyroid as being merely fibrous sacs filled with

fluid. A great majority of the thyroid cysts are thyroid adenomata which have become necrotic in their center, the glandular structures gradually being liquefied and converted into fluid, the fibrous capsule of the adenomata serving as the sac containing the fluid. Anyone, however, who has removed cysts of the thyroid in any considerable number will recall that in a great majority of instances plaques of active, well vascularized thyroid tissue persist on the cyst walls, viable, unabsorbed and capable of malignant degeneration. For this reason, one must not assume that cysts of the thyroid possess no possibilities of malignancy. Otherwise the indications for surgical treatment of thyroid cysts are similar to those in adenomata of the thyroid.

The point of origin of the thyroid gland in the fetus, as you will doubtless all recall, is represented in the adult by the foramen cecum at the apex of the circumvallate papillæ on the back of the tongue. Originating at this point, the thyroid in the course of its normal development descends through the base of the tongue, usually behind the hyoid bone, to its location on the upper tracheal rings. In the fetus, the thyroid is connected with the intestinal canal by means of a short tube, the thyroglossal duct, the point of entrance of which in the fetus is marked in the adult by the foramen cecum. Failure of the thyroid to descend results in one or more of the types of aberrant goiter, the most common of which causing trouble are the lingual, intralingual and sublingual. We have had one case of lingual goiter causing such obstruction as to interfere with swallowing. Removal of this mass from the base of the tongue, while necessary to save life, resulted in the production of myxedema. Lingual goiter, therefore, is to be suspected when a soft, vascular mass appears on the base of the tongue, in the base of the tongue or just below it, in the median line and should be removed surgically when the tumor interferes with swallowing.

For the purpose of simplicity and because we know of no physiological evidence to indicate that there is more than a single secretion to the thyroid we will consider the matter of thyroid toxicity either originating from adenomata or from the hyperplastic gland of primary hyperthyroidism or exophthalmic goiter as one, and discuss the entire question of thyroid toxicity under the single head of thyroidism from a surgical point of view.

We have often stated, from a review of our experience with thyroid disease, now amounting to thirty-two hundred thyroids operated upon, that failure to cure toxic goiter is due largely to one of two factors, either a removal of an insufficient amount of thyroid tissue or operating upon patients whose symptoms are not in reality thyroid in origin. From the latter statement, it is clear, as we have stated earlier in this discussion, that to obtain good results the critical study and observation of toxic patients pre-operatively is essential, in order that those neurotic individuals—sometimes even with benign, inactive thyroids—may be segregated from those with true thyroidism and not be submitted to surgery. It is obvious at once also, no matter what form of treatment is employed, that this same practical segregation of cases must be employed to obtain results which are of value and may be reliably interpreted as thyroid cures.

In view of Dr. Hamilton's discussion of this subject, it does not seem necessary for us to go into the question of the diagnosis of thyroid toxicity, except to state that accurate history-taking, painstaking clinical examination, at times prolonged observation and repeated basal metabolic estimations may be necessary to determine the presence or absence of this condition.

We have so often seen exophthalmic goiter patients progress into such stages of intense intoxication that death resulted while under conservative methods of treatment; we have so often seen cardiac complications, as spoken of by Dr. Hamilton, in the form of irregularities and decompensation, associated with thyroidism, and we have so often seen patients die as the result

of deferred and inadequate treatment that we have arrived definitely at the conclusion that the best form of treatment for a condition as serious as thyroidism is the one which most quickly, most certainly, most completely and most permanently relieves their toxicity, and that, in our opinion, is surgery.

The employment of casual surgery in the hands of an individual not equipped for the special study and operative and postoperative care of these conditions will yield poor results, both in the way of cure and mortality, but where each patient is studied and cared for in an organized and individualized manner, the mortality will rarely be higher than 1 per cent, including even the most desperate risks, and the outcome one of the most satisfactory and gratifying which follows any surgical operation.

OBSERVATIONS ON THE DIAGNOSIS OF THYROID TOXICITY AND CLINICAL USE OF THE BASAL METABOLISM TEST: THE THYROID HEART [1]

By BURTON E. HAMILTON, M.D., Boston

THERE are several factors which are seldom stressed in general discussion of the treatment of thyroid disease, which appear of great importance when dealing with actual patients. The first (in importance) of these factors is correct diagnosis of *toxic symptoms.*

Almost one-third of the patients reporting to our clinic prove to have no disease attributable to the thyroid gland. A small fraction of this group report because of suspected goiters that prove not to exist. The majority report because of symptoms which wrongly suggest thyroid toxicity.

Diagnosis of thyroid toxicity is far from being on a satisfactory basis. From the point of view of the patients, diagnosis is a double problem. It is easy to overlook thyroid toxicity, and case histories show that many thyro-toxic patients are overlooked and wrongly diagnosed for long periods, often by physicians of the highest standing. A few have been treated, for example, for diabetes, pulmonary tuberculosis, nausea and vomiting of pregnancy, and even operated on for acute surgical abdominal conditions. But the great majority of overlooked cases have been suspected of a heart disease. Obscure thyroid toxicity can suggest all these and other diseases. Those of us who are treating thyroid disease are not so directly concerned, perhaps, in cases of toxicity overlooked as in the correct diagnosis of those already suspected and sent to us for treatment. Of the many patients diagnosed as having thyroid toxicity, but who do not have it, a very small fraction have a heart disease or pulmonary tuberculosis or chronic nephritis. The overwhelming majority have no disease whatsoever but are in what may be called, for want of a better term, a neurasthenic state.

Differentiating thyroid toxicity from neurasthenic states is a constant problem in a thyroid clinic, and at the risk of being tedious I wish to emphasize it. Before the World War it is fair to say there was no general recognition of a neurasthenic state simulating thyroid toxicity (and heart disease) as an entity, even among physicians dealing with large numbers of thyroid patients. During the World War so many soldiers of all armies were disabled by breathlessness, easy fatigueability on exertion or excitement, tremor, rapid heart, and vasomotor disturbances that investigation was forced. When physicians fresh from civil practice for the first time saw these cases grouped together in large numbers in army hospitals, they invariably felt that the cases had thyroid toxicity. (X-ray therapy directed at the thyroid gland, among many other measures, was recommended.) Very careful study of their symptoms was made from all available angles.[2] This, and prolonged observation, served to convince the physicians studying these cases that the thyroid was not concerned in this condition. The condition was variously named "effort syndrome," "soldier's heart," and "neurocirculatory asthenia." This disorder, under its different names, was much discussed during war times and now is seldom mentioned.

But the soldiers differed in no way from the neurasthenic and fatigued individuals who in civil life report to thyroid clinics in numbers almost equalling the patients with a true thyroid toxicity.[3] Even now we sometimes find it suggested that thyroid toxicity and neurocirculatory asthenia (under this or some other name) are phases of the same disorder.

[1] Read before the Radiological Society of North America, at Cleveland, December, 1925.

[2] The most notable work was done by Thomas Lewis and his co-workers.

[3] There was even more difficulty in freeing the heart than in freeing the thyroid from blame as the cause of "neurocirculatory asthenia."

Neurocirculatory asthenia, — whatever one calls it,—is as distinct from thyroid toxicity as, for example, ordinary recurrent headaches are distinct from tumors of the brain. Patients with neurocirculatory asthenia wrongly suggesting thyroid toxicity are unlike thyro-toxic cases in that: (1) In spite of their complaints, they withstand severe strains, such as infectious diseases, major operations, and pregnancy, as safely as normals; (2) They do not develop auricular fibrillation, or congestive heart failure, or both, and die; (3) They do not require surgical or X-ray or any other treatment directed at the thyroid gland; (4) If operated on, they do not show the characteristic immediate improvement shown by true thyro-toxic cases; (5) If watched over a period of months, most of them will improve, regardless of what is done for them. Where they are wrongly included in groups supposed to be thyro-toxic, they confuse the results of treatment. Treatment which should give quick results fails to do so; forms of treatment supposed to require a long period may appear to have succeeded in a portion of the cases.

There are no signs or symptoms or combinations of these that would enable a physician not particularly trained in this diagnosis to succeed with any reasonable accuracy in differentiating these cases. The symptoms distinctive of thyroid toxicity, and not associated with neurocirculatory asthenia (eye signs, goiter, pigmentation, menstrual changes are a few examples) may not appear at all, or in any degree, at any time in definitely toxic cases. Thyroid toxicity may begin suddenly or slowly and follow any course. There is no clear, accurate picture of thyroid toxicity easily made familiar to the diagnostician. The disabling symptoms, common to both conditions, namely, vasomotor disturbances, increased fatigueability, tachycardia, tremor, are often the only clear symptoms presented by individuals in either group, and these symptoms have no distinguishing points for easy differentiation of the two disorders.

It is, however, possible for any physician by long association with thyro-toxic cases to learn to value clinical signs and points in history, so that the majority of doubtful cases can be separated satisfactorily into toxic and non-toxic groups, but it takes a long time and special study to learn to do it: witness the constant number of wrongly suspected cases referred to a thyroid clinic, often by men of the highest standing and with broad experience in general diagnosis.

Basal metabolism estimations are the only generally accepted, indirect laboratory test of thyroid toxicity in present use. Undoubtedly toxic cases as a group have high basal metabolism, and non-toxic patients, including those cured of toxicity, have, as a group, normal readings. But falsely high basal metabolism tests are very common. To be trusted, basal metabolism tests must (1) Be made in a carefully conducted laboratory by experienced technicians; (2) The patients must be kept in hospital at least over night before the test; (3) The test must often be repeated on consecutive days many times before the true basal metabolism can be determined. To interpret correctly—

(1) One must not accept either a single high or normal basal metabolism test as evidence of present or absent toxicity, when it does not check with physical signs and history.

(*a*) Non-toxic neurasthenic patients show wide fluctuations in their tests. Typically, they have an elevated test at the first trial and typically come to normal only after one or more repetitions,—but they often behave atypically.

(*b*) Normal basal metabolism tests in truly toxic patients are rare—they may occur. They are commoner now that iodine is being pretty generally administered to toxic or suspected toxic patients. From our experience, iodine tends to mask toxic symptoms and lower basal metabolism in some toxic patients

to some degree for a varying length of time.

(2) Granted repeated tests resulting in finally obtaining a "true" basal metabolism in a given case, there is no hair line above which to classify all as abnormals, and below it all as normals.

(3) A small but important group of suspected thyro-toxic individuals have a complicating disorder which tends to elevate basal metabolism readings by itself,—in particular, patients with cardiac decompensation. In diagnosis of these cases basal metabolism tests cannot be made useful.

If used in diagnosis or as a check on treatment, basal metabolism tests are of true value only if very carefully done under favorable conditions and critically interpreted in the light of clinical findings by physicians of experience in this particular problem.

Difficulties in care of thyro-toxic patients independent of type of treatment used.—In general discussion of the treatment of thyroid toxicity one usually bears in mind only the clearly diagnosed and uncomplicated cases. The uncomplicated thyro-toxic patient may suddenly become desperately sick. An apparently mild acute infection or mental shock may send an apparently mildly toxic case into a thyroid storm which may result in death. This does not often happen, but in large groups of truly toxic patients watched for a period of, say, six months, it is sure to happen in a few instances. Many times early threatening storm signs can be recognized, proper palliative treatment instituted, and the patient returned safely to mild toxicity. The use of iodine in toxic cases is not sufficient by itself to cover these emergencies. From our experience, these uncomplicated typical thyro-toxic cases,—the ones usually borne in mind in discussion of, for example, the surgical death rate,—when once they are under control in a hospital, can be so safely handled by thoroughly trained clinics, if conditions are ideal, that it is within the bounds of possibility to reduce their surgical death rate practically to zero. They have furnished only a tiny part of the surgical death rate in our clinic. Rare, uncontrollable, intercurrent infection (for example, an influenza or a severe tonsillitis occurring at just the wrong time after operation) should furnish the only exceptions to this statement.

A large part of an actual group of thyro-toxic patients have serious *complicating disorders.*

(1) Large groups of thyro-toxic patients include, of course, a percentage with complicating old age, hypertension, nephritis, pulmonary tuberculosis, diabetes, and so forth.

(2) Unlike other large groups of patients, definitely thyro-toxic cases include, because of the effect of thyroid toxicity itself, 35 per cent with complicating heart disorders of a serious but treatable nature.

Ideal treatment of a group of thyro-toxic patients should afford special care of the small sub-groups with complicating disorders, and demands special recognition and care of the cardiac complications.

The heart as a factor in the control of patients with thyroid toxicity.—About 35 per cent of toxic patients have a serious disorder of the heart beat,—auricular fibrillation or (rarely) auricular flutter. These conditions occur in (1) transient attacks; (2) very frequently repeated "paroxysmal" attacks; (3) as an established condition. They occur, as a rule, among the older and the more toxic patients.

The auricular fibrillation is easily recognizable and to a limited degree is improved by proper medication. All those with complicating auricular fibrillation, and particularly those with established auricular fibrillation, constitute a fragile group. Though the great majority live on with more or less disability, an occasional case will die suddenly without warning and without discoverable cause. An occasional case has a fatal embolus from an intra-cardiac thrombus. Nevertheless, as a group they have withstood the brief strain of surgical treatment and convalescence well. The re-

sults of surgical treatment in this group have been highly gratifying.

I have kept personal watch of these cases. Those with transient attacks of auricular fibrillation and those with paroxysmal attacks of auricular fibrillation, and a large portion of those with established auricular fibrillation, return promptly and permanently to normal heart rhythm when relieved of thyroid toxicity by surgical measures. It is a law that when auricular fibrillation is due to thyroid toxicity alone, and the toxicity is thoroughly cured, the heart will return permanently to normal rhythm.

Again, in this group any treatment which requires a long period for results will carry an unavoidable death rate from the cardiac complications purely because of the time factor, which treatment bringing quick results would avoid.

Many of the group with auricular fibrillation have *congestive heart failure*,—true decompensation. This is a unique group in cardiovascular disease. The majority of these cases are completely disabled. They are very fragile, and individuals among them die suddenly and without warning or for slight cause, such as a mild acute infection or over-exertion. Those that live on tend typically to resist all medical attempts to relieve their failure. Though they apparently furnish the most undesirable sort of risk to a surgeon, when properly prepared they survive surgical treatment. To date, there have been operated on in Dr. Lahey's clinic approximately 125 such thyroid patients with congestive heart failure. There have been three operative deaths. The cases in this group average more than fifty years of age,—many are in the sixties, some in the seventies. They have a distinctly short expectation of life, if untreated. Improvement follows surgical treatment within a few days. It is difficult to believe that a method of treatment involving several months for improvement would not only prolong the disability but at least equal this surgical death rate in this group.

I carefully investigated the cases with thyroid toxicity and congestive heart failure who had been operated on in the clinic from 1920 to 1923. These have been reported. I succeeded in tracing 31 living cases. They averaged a total bed or bed-and-chair disability of twenty months before operation. And at the time of my investigation (with one partial exception) they had averaged two years of full ability.

If a group of thyro-toxic patients is to be handled adequately, special care of the heart condition must be included.

CONCLUSIONS

Dealing with thyro-toxic patients requires: (1) Long experience in differential diagnosis, particularly special experience in differentiating neurocirculatory asthenia from thyroid toxicity; (2) A carefully conducted basal metabolism laboratory; (3) Familiarity with the danger signs of severe thyroid toxicity and knowledge of their treatment; (4) Special simultaneous recognition and treatment of the usual complicating diseases, but particularly recognition and care of the 35 per cent with complicating serious heart disorders; (5) Safe treatment must afford not only a low immediate death rate but prompt results.

Because of the inherent difficulties of diagnosis, of elaborate special treatment required for the inevitable complications, and the occasional alarming sudden changes of thyro-toxic patients, they cannot be comfortably managed by an individual physician seeing only occasional cases. These patients tend to breed clinics.

The large thyroid clinics in this country may have started with some enthusiastic surgeon operating on thyroid glands. Now the thyroid clinic is no longer purely a skilled surgical team, but an elaborately equipped diagnostic clinic, and one with specialists to control the many non-surgical aspects of thyroid disease. In my opinion, the only reason for the existence of these clinics is their success. If a method of treatment for certain types of thyroid disease is ever discovered which is easier than surgical treatment and is equally efficacious

and prompt, I believe these clinics would immediately adopt it. If not, they would soon cease to exist for want of patients. I have taken histories of every case treated in Dr. Lahey's clinic for thyroid disease for the last five or six years, and have been impressed by the lengths to which the average thyro-toxic patient will go to postpone or avoid operation. Most of them are there only because they have tried everything else suggested and have not lost their disability. The promptness and thoroughness and safeness of surgical treatment on these individuals who have tried other measures unsuccessfully has forced itself upon me against my previous convictions. The results of surgical treatment on the thyroid cases with cardiac complications, in particular, have been nothing short of miraculous when compared with results of medical treatment on these particular cases and on cardiac cripples in general.

THE THYROID GLAND IN RELATION TO "TOXIC GOITER" [1]

By ALLEN GRAHAM, M.D., CLEVELAND, OHIO

THE term "toxic goiter" is used to include those clinical conditions variously classified as Graves' disease, Basedow's disease, thyrotoxicosis, hyperthyroidism, dysthyroidism, exophthalmic goiter, toxic adenoma, etc.

The prevailing tendency seems to be to recognize two presumably distinct and independent types of toxic goiter. For convenience these may be designated (*a*) exophthalmic goiter, and (*b*) toxic adenoma. Except for such differences as may be due to variations in intensity and duration of disease, we find it inconsistent with our personal experience to accept a fundamental distinction between these two supposedly definite, and, in some respects, diametrically opposed clinical entities. However, in deference to differences of opinion that may exist, the terms, "exophthalmic goiter" and "toxic adenoma" will be used in referring to the clinical state of patients, but not to the condition of the thyroid gland.

We take the view that the clinical condition called "toxic goiter" does not originate as a disorder of the thyroid gland primarily. There are no facts that warrant ascribing to the thyroid the unique property of initiating its own pathological processes. The pathological changes found in the thyroid in toxic goiter are secondary; they are effects and not causes. These and other considerations render the theory of the thyrogenic origin of toxic goiter improbable.

As an alternative we are willing to accept, at least tentatively, two essential factors of etiological importance: (*a*) a fundamental constitutional factor, the exact nature of which is unknown, capable of being affected by (*b*) a number of exciting or accessory factors of a more tangible or understandable nature. Among the latter may be mentioned various forms of psychic or traumatic shock; various infectious diseases (tuberculosis, tonsillitis, influenza, pneumonia, typhoid fever); various physiological states, such as puberty, pregnancy, and the menopause; overwork, worry, anxiety, and fear; possibly various endocrine and metabolic disorders, and possibly the administration of too much iodine. The constitutional factor may or may not be specific; it is commonly referred to as "hereditary predisposition," "instability of the nervous system," "constitutional dyscrasia," "autonomic imbalance," etc.; the fact is, we know very little about it. The accessory factors are non-specific.

The alternative conception of the etiology of toxic goiter appeals to us because it seems to harmonize with clinical experience and is not at all inconsistent with the pathological changes encountered in this disease.

Since the cause of toxic goiter has not been satisfactorily explained, all therapeutic measures now in vogue rest on an empirical basis and are to be justified by the results obtained in carefully observed cases, consistently treated and adequately followed, having due regard for the minimum risk to the patients and the maximum relief from their disability.

The chief therapeutic efforts, at least of surgeons and radiologists, have been directed against the thyroid gland, and for this reason it is our opinion that surgeons and radiologists should have a clear understanding of the pathology of the thyroid and the relation of this organ to toxic goiter.

The changes that take place in the thyroid in toxic goiter are in part physiological and in part pathological. The former includes hypertrophy, hyperplasia and involution. The latter includes the degenerations, atrophy and fibrosis, inflammations and malignant disease. Any or all of these processes may occur in the thyroid in some cases of toxic goiter. For present purposes we need consider only hypertrophy, hyperplasia and involution, since these changes, even to the present day, are considered by some to be specific for the disease. In the

[1] Read before the Radiological Society of North America, at Cleveland, December, 1925.

developmental period of toxic goiter that has been allowed to run its natural course, the thyroid undergoes hypertrophy and hyperplasia; it increases in size; becomes softer and more vascular, usually there is thrill and bruit, and the iodine and colloid material diminish in quantity. Other conditions being equal, the degree of change varies with the intensity and duration of the disease. During the period of recovery, whether spontaneous or induced, there is a reversion to a colloid or resting state. Hypertrophy and hyperplasia represent the anatomical response of the thyroid to an insufficient quantity of iodine available for storage. Conversely, involution is the natural end-result of supplying a sufficient quantity of iodine to a hypertrophic and hyperplastic gland. There are no facts, clinical or experimental, that warrant a different interpretation of these processes. Identical qualitative changes occur in simple or endemic goiter, exophthalmic goiter, and toxic adenoma. The only specificity involved in hypertrophy and hyperplasia is in relation to the availability of iodine for storage.

The thyroid may be influenced in three ways as regards iodine:

1. There may be an absolute iodine deficiency—the natural intake of iodine being inadequate for normal body requirements.

2. There may be a relative iodine deficiency—the natural iodine intake being adequate for normal requirements but not sufficient to meet additional demands of puberty, pregnancy, menopause, infectious diseases, etc.

3. A relative or absolute deficiency may result from hyper-utilization of iodine. This seems to be the case in toxic goiter.

In any of the above conditions, whether iodine deficiency be absolute or relative, the effect upon the thyroid is the same, namely, depletion of stored iodine, followed by hypertrophy and hyperplasia. It is not the cause of the hypertrophy and hyperplasia, but the cause of the hyper-utilization of iodine in toxic goiter that constitutes the important problem for future investigation.

Adenomata and adenomatous changes are encountered in the thyroids of patients who have simple or endemic goiter, typical exophthalmic goiter, and that clinical condition referred to as toxic adenoma. In an extensive experience with the pathology of the thyroid, we have found no anatomical, histological, chemical, nor pathological qualities in adenomata or adenomatous thyroid tissue, such as would furnish a reliable basis for distinction between toxic and non-toxic goiter. We have found colloid adenomata in hyperplastic thyroids, and hyperplastic adenomata in colloid thyroids, and this may occur in either toxic or non-toxic goiter. Adenomata tend to respond to an adequacy or inadequacy of iodine by hypertrophy, hyperplasia and involution, in a manner similar to the non-tumorous thyroid, but perhaps with not the same facility.

Regarding the effect upon the thyroid of such therapeutic measures as surgical removal, X-ray and radium irradiation, and iodine treatment, the following observations may be made:

Surgeons are confronted with the question of how much gland to remove. The removal of too little tissue yields less favorable clinical results. The removal of too much tissue may result in myxedema. Prior to the adoption of iodine as a measure preliminary to operation the rule was to remove three-fourths to seven-eighths of the gland. The removal of so much tissue from patients treated with iodine may increase the post-operative incidence of cases with basal metabolic rates below normal, with or without clinical manifestations of myxedema, as has been noted in our own experience and as reported by Lahey. We believe there is a definite use for iodine after operation to prevent regeneration hyperplasia in those glands that have not been completely involuted before operation.

Concerning the effect upon the thyroid of roentgen-ray and radium irradiation, the present state of our knowledge is too unsatisfactory to warrant definite conclusions.

The variable factors involved in a study of this problem are such as to require reduction to some common denominator before reliable interpretations can be made. In a general way, there is clinical and experimental evidence to indicate that irradiation produces adhesions between the thyroid and surrounding structures; that fibrosis of varying degrees occurs; that vascularity decreases; that the volume of the thyroid diminishes. It is doubtful whether the above changes can be distinguished, on an anatomical basis, from changes of a similar nature and of equal degree in thyroids that have not been irradiated. Very little information is available as to the effects of irradiation upon the function of thyroid apart from the anatomical changes that may result.

The implantation of radium produces localized areas of necrosis followed by fibrosis, and these changes are quite similar to those produced by the injection of boiling water, alcohol, quinine and urea, iodine, carbolic acid, etc.

Iodine is being extensively used as a therapeutic agent without proper consideration for what it may be reasonably expected to accomplish; without sufficient appreciation of its indications and contra-indications. The indications and contra-indications are derived from the state of the thyroid itself. The only known indications for the administration of iodine to any patient with goiter are hypertrophy and hyperplasia of the thyroid, irrespective of clinical diagnosis otherwise. Hypertrophy and hyperplasia may be recognized by softness of the gland, increased vascularity, thrill and bruit.

The clinical response of patients with typical exophthalmic goiter and typical toxic adenoma to the administration of iodine is identical, varying only in degree, and depends upon the age and condition of the patient, the duration and intensity of the disease, the state of the thyroid at the time, the quantity of iodine given, and whether or not the patients previously have been taking iodine.

THE ROENTGEN THERAPY OF EXOPHTHALMIC GOITER [1]

By EDWARD L. JENKINSON, M.D., Assistant Professor Northwestern Medical College; Director Roentgen Department, St. Luke's Hospital and St. Joseph's Hospital, CHICAGO, and Evanston Hospital, EVANSTON, ILLINOIS

IT is not the intention of the essayist to precipitate an argument with the surgeon or the internist. We do not intend to claim in the progress of this paper that the X-rays will cure all types of goiters or even all exophthalmic goiters. I am sure from past experiences that we are cognizant of the limitations of radiation. To claim in an unqualified manner that the X-rays are a panacea in all types of goiters is to bring the profession into disrepute. That there are cases that respond to surgery is a known and accepted fact; that some patients respond and get well under rest is also a known fact; that there are cases that can be cured by X-rays is also true. In this symposium, talking of cures, we must all admit that there are cases that have hitherto failed to respond to surgery, rest or the X-rays. In these refractory cases the close co-operation of the surgeon, internist and roentgenologist is imperative.

In our thyroid work at St. Luke's Hospital we have enjoyed the close co-operation of an internist, Dr. N. C. Gilbert; a surgeon, Dr. H. E. Mock, and a pathologist, Dr. Arthur Rissinger. Each patient is gone over very carefully before deciding what is the best method of treatment.

In this discussion of roentgen therapy we will consider chiefly the exophthalmic type of goiter, but we believe, however, that good results can be obtained with any type of hyperfunctioning thyroid, although not with equal certainty. It is a well established fact that in the treatment of the exophthalmic type of goiter the X-rays are of great value, and in the majority of cases a cure can be obtained.

In the treatment by means of the roentgen rays it is important that the patients be properly selected. There are doubtless cases that should be referred to surgery at once; among these would be cases where mechanical pressure of the enlarged gland upon the trachea or other structures causes symptoms. There are a few other cases where surgery appears to be more efficient in the light of our present knowledge. What the determining factor is, I am not prepared to say. I am, however, equally certain that many of the cases now operated upon would do better under roentgen therapy.

Every patient with a high metabolic rate, without pressure symptoms, should be treated with the X-rays. From past experiences we feel that all cases should be hospitalized; the results will be better and certainly more prompt. Patients should be kept in the hospital during treatment and the succeeding week, when possible, as the metabolic rate may take a sharp rise following treatment, even doubling in some instances. During the period between the seventh and fifteenth day the metabolism recedes to the initial rate and then usually starts to fall lower.

It is not advisable to place these patients in a general ward where patients seriously ill or convalescent are either complaining or telling of their past and present ailments. It is preferable that goiter patients be placed in a private, or at least a semi-private, room. If it is not possible to keep them in a private or a semi-private room in a hospital, they should be kept at home in bed and brought to the roentgen department every other day for treatment. Occasionally, good results are obtained with the patient up and about, but not with equal certainty. All persons attending the patient should be warned not to argue or displease her, as each time she becomes irritated and excited a definite setback is the result. Worry should be eliminated; keeping the patient in good spirits helps a great deal in the treatment; in fact, everything possible

[1] Read before the Radiological Society of North America, at Cleveland, Dec., 1925.

should be done to add to the patient's general comfort. When the patient is brought to the X-ray department for treatment she should be told in an assuring manner that the procedure is devoid of any danger and is entirely harmless, if she will but rest quietly. It is always advisable to have the transformer and motor in another room; in this way the noises are obviated and the patient is more reposeful. After the treatment she is returned to her room and kept in bed. Always inform her that her neck will become swollen for a time following the treatment, the enlargement being only transitory and that it will subside within twelve hours. Mild sedatives may be advisable during and just succeeding the treatments.

In the treatment of exophthalmic goiters it is not necessary to obtain a tanning of the skin. It is well to remember that the skin of the exophthalmic is more sensitive than that of the normal individual. The usual rule is not to give more than 30 per cent of the erythema skin dose during one series. I do not believe there is any advantage in larger doses and I can think of many disadvantages, such as telangiectasis and permanent pigmenting of the skin following heavy doses. If tanning of the skin occurs, in later years the skin will become red and irritated when exposed to the wind.

The subject of burns following X-ray therapy of the thyroid has been a much advertised argument used by some people opposed to this form of treatment. In our experience of ten years, comprising a series of over five hundred cases, we have never had a burn or even a marked erythema. If the dosage is properly estimated by carefully measuring the voltage and milliamperage and if the filters are closely checked, I am sure no burns will result.

A word here in regard to the measuring of the voltage. Do not allow any manufacturer or any of his agents to sell you a machine with the understanding that after it is once calibrated the voltage will always be the same for the calibrated settings. If this information is taken for granted and patients treated henceforth, serious results will follow. Every machine used in therapy should be tested each time a treatment is given with sphere gaps. The voltage delivered to the tube differs with the line voltage, and as the contacts on the rectifier become dirty there is also a marked change. The safest and best policy is to test your own machine and depend upon your own observations.

The period of time which may be expected to elapse between treatment and improvement is problematical, differing with each case. In some instances improvement will be apparent ten days after the first series, while other cases will show no improvement until two, or possibly three, series have been completed. It has been our experience to note some improvement three weeks after the first series in the majority of patients. During the past three years we have seen patients continue to show a metabolism of plus 40 for three series and then suddenly fall to normal, accompanied by a gain in weight and a slowing of the pulse rate. The toxicity of the patient does not seem to be the main factor in determining the rate of improvement, some of the most severe cases improving more readily than the less toxic types. Recently we have seen a patient with a metabolic rate of plus 112 which fell to plus 30 following one series, accompanied by a gain of ten pounds in weight. This patient had had a sub-total resection. The rate dropped, following operation, from 115 to 112, even after two months' post-operative rest. Quite frequently patients with a metabolic rate of plus 30 respond very slowly, the pulse rate remaining rapid, and a gradual loss in weight taking place. In this type of patient it is well to change the X-ray technic. Quite recently we had a patient who responded poorly to three series of treatments, and the doctor who referred the case was becoming discouraged and threatened operation. We pleaded for one more chance. For the fourth and deciding series we changed our filters from six to four millimeters of aluminum, and, following this

treatment, there was a marked improvement.

In our series of cases we have treated a hundred post-operative goiters, operated on in all parts of the United States except Cleveland. The patients have ranged from mild types to the very severe. In many cases, the metabolic rate has been higher following the operation than before, and the results in these cases have been uniformly good. We do not, however, advise operation prior to radiation on the theory that it will minimize the dangers of radiation, as does the surgeon who often advises radiation and later operation, the former lessening the dangers of the operation. In so advising, the surgeon openly admits that radiation has some merit, and if he will but allow the therapy a fair chance, in practically if not totally all cases, operation will not be necessary. The plan of treatment in post-operative cases is essentially the same as in cases that have not been operated on. Fortunately, operation does not add to the difficulty of radiation, as the surgeon claims radiation adds to the difficulty of thyroid removal. The careful estimation of the dose, governed by the metabolic rate, is the important factor.

For a number of months we used Lugol's solution before X-ray therapy. In all the patients there was a marked decrease in the nervous symptoms and the metabolic rate. Considering the drop in the metabolic rate and the general improvement, we thought it might be well to give all patients Lugol's solution during radiation. This plan was followed for a time, but, to our disappointment, we found that our X-ray dosage was too small, and in the course of a month the metabolism was back at the original rate. The patient would start with a metabolism of plus 50 and, after a week of iodine, would drop to plus 25 or lower. Roentgen therapy would then be started and a series of small doses given. One month after the treatment the rate would be again at plus 50. From this experience we decided that during radiation no iodine medication should be given, as it masks the symptoms and makes it impossible to estimate carefully the X-ray dose. This is really our only objection to the use of iodine during radiation of the thyroid. The patients who had been on Lugol's solution were later radiated, after discontinuing the drug, and the usual improvement followed. The importance of an accurate metabolic rate is here manifest in the estimation of the dose necessary to bring about the desired results.

The question is often asked, How many cases of myxedema do you encounter following X-ray therapy? In ten years' experience with roentgen therapy of goiters we have yet to see in our series, a case of myxedema follow radiation. We have had two patients gain considerable weight and show a minus metabolic rate following therapy. The symptoms persisted for a period of two months, when the rapid gain in weight stopped and the metabolism returned to normal.

Regarding injury to the parathyroids: It seems quite possible that the parathyroids might be injured by radiation. I have made inquiry of several staff members for whom we have treated many thyroids, regarding this matter: from none have I been able to learn of a positive case. On interviewing Dr. Robert Preble, I asked him the question regarding functional disturbance of the parathyroids. He thought it was possible that the parathyroids might be injured, but he had never observed changes during or following radiation that he could attribute to that source.

The subject of operation following radiation is a much-discussed question and has been argued pro and con. There have been arguments put forward by many surgeons that radiation increased the bleeding, due to changes in the blood vessels' walls, and also caused an excessive amount of connective tissue, which added to the difficulty in the removal of the gland. Not being a surgeon I am not prepared to argue the question. I can, however, quote what I have learned from various surgeons on our staff. Most of them claim they experience very

little difficulty following radiation, unless a great deal has been given over a long period of time, followed by telangiectasis. It is in these cases of long treatment that they encounter profuse hemorrhage and an abundance of connective tissue.

One of our leading surgeons opposed at that time—five years ago—to radiation, always complained when he had a difficult thyroid: the X-ray was to blame in all instances. During this time we were treating a toxic goiter. Because of the patient's failure to obtain complete relief from X-ray therapy, it was thought advisable to resort to surgery. The young lady had had a large number of treatments, seven series in all. In the transfer from the medical to the surgical service she was assigned to the above-mentioned surgeon for operation. In the course of the transfer he was not advised of the previous radiation. Following the operation he was asked as to the difficulties encountered in the removal of the gland. To our surprise he said he had experienced no difficulty, either in the amount of connective tissue or hemorrhage.

The settlement of this question is primarily surgical and it rests with the surgeon to decide. The question does not appear of great importance, as the number of patients who go to operation following proper radiation is negligible. The radiation of postoperative thyroids is certainly more important and frequent.

For the past five years metabolic determinations have been made on all cases of goiters referred for radiation, and I am sure our work has been a great deal more satisfactory since we have followed this plan. I do not believe an exophthalmic goiter is ever encountered with a metabolic rate constantly normal or below normal. There are periods when the rate may be approximately normal, but these are temporary and are accompanied by a remission in the symptoms. It is only by frequent metabolic determinations that an accurate X-ray dosage can be established. For example, two patients suffering from exophthalmic goiter are referred to the roentgen department for therapy. One has a metabolism of plus 90 and the other a plus 40 metabolic rate. It is evident that these patients cannot be given the same amount of radiation. If the patient with the plus 90 is given a large dose of X-rays, the rate following the series will increase, in some instances as much as 40 per cent. It is quite obvious what the reaction would be. We have seen patients with a relatively low rate of plus 20, increase to plus 60 immediately following the series. Since these experiences we have leaned toward the smaller doses and accepted the metabolic rate as the deciding factor. In recent years it has been our practice not to treat a patient with a metabolic rate of plus 25 or below, unless there are special reasons. If there is some doubt as to the accuracy of the test we have the patient return for another examination. It is possible that the rate may be increased at the later examination, the first test having been made during a remission. It is our opinion that the basal metabolism is the deciding factor in the diagnosis of exophthalmic goiter. Most of the patients for metabolic determinations are hospitalized; we believe, however, that an accurate test can be made on out-patients, provided they will come to the department and rest on a cot for an hour before attempting the test. The determination should not be made until the patient is thoroughly familiar with the apparatus. It is absolutely imperative that she be quiet and composed, if an accurate test is to be obtained. If, during the test, the patient becomes nervous and struggles with the apparatus, the results will be inaccurate and the determination must be repeated. In the differentiation of borderline cases, the test is of paramount importance. Not long ago we saw a case suffering from many indefinite symptoms, in whom the diagnosis was a quandary. Due to her rapid pulse a metabolism was done and the rate was found to be plus 45, since which time she has had one series of X-rays and is greatly improved.

For months following radiation, we require the patient to return for frequent metabolic tests, even after all symptoms have disappeared.

The question is often asked, How long following radiation will the patient remain well? At the present time we have several cases well after ten years. During the ten years they have received no further treatment and have been able to carry on their daily duties. We have some three hundred cases well after four years. These patients have been carefully checked by metabolic determinations and are seen from time to time by an attending man. There is a certain class of patients who require occasional re-treatment of one series. In part of this group, we believe it is due to insufficient treatment in the first series. For the remainder, we are at present unable to assign any reason. Before the patients are completely cured they return to hard, confining work, which quickly leads to an exacerbation of all symptoms. It is well to tell these persons they will get well much quicker and surer and will be money ahead if they will follow instructions, attending to their most important duty — conservation of health. If they will not agree to do so, they are advised that it is useless to expect a cure from radiation. Surgery might just as well be resorted to in this type of case in the beginning.

In our series of cases we have had one death, but, as no autopsy was done, we are unable to give the cause. The patient was a young woman with a relatively high metabolic rate. The first series of X-rays caused no untoward symptoms; the second series was given after a lapse of one month, three treatments at intervals of three days. After the series the patient's skin became bronze, not unlike an Addison's disease. Accompanying the bronzing of the skin was a profound cachexia with a marked fall in blood pressure. In a short time she became delirious, and death followed in a few days. It may be possible that in this case the X-rays played a part in the fatality. A similar reaction was observed in one of the Western States after complete extirpation of the patient's thyroid. In this case thyroid extract was given and the patient recovered.

It is advisable to discontinue roentgen treatment temporarily when the metabolic rate falls to about 30 per cent, as the metabolism may continue to fall some time after the last treatment. If the metabolism does not continue to fall or begins to increase, treatment must be resumed at once, carefully checked by frequent metabolic determinations. I think that some of the cases of hypofunction reported are due to failure to follow this rule. Inadequate results also occur because the metabolic rate is not followed after what is supposed to be the last treatment. If the metabolic rate does not continue to fall after the last treatment, or tends to rise, two additional treatments under these conditions will insure permanent good results.

I believe our good fortune in not having a case of myxedema is due to the fact we temporarily have discontinued radiation when the metabolism has dropped to plus 30 per cent; the treatment is not resumed if the metabolism continues to fall.

Another important symptom during the treatment of goiters to which we have paid special attention is the rapid gain of an excessive amount of weight. If, following a series of treatments in a patient with a very high metabolic rate, there is a marked drop in the rate, accompanied by a gain in weight of fifteen to twenty pounds, treatment should be discontinued for a time. If these patients are not closely checked and are treated without a metabolic rate, myxedema may follow.

Occasionally, for some reason or other, patients are called out of the city, and remain away for many months, meanwhile forgetting all about previous instructions regarding examinations and metabolic determinations. When they return they occasionally show symptoms of their old trouble. In these cases treatment should be instituted, and it has been our experience that they will respond as well as during the

previous treatment, and a cure can be expected if they follow directions.

If a patient is sent to you with a history of previous radiation, do not be discouraged and send the patient away. Perhaps the treatment has not been properly administered or possibly the patient did not co-operate and come back for treatment as directed. Before treating the patient, find out where she was radiated and obtain from the radiologist what factors were used in the treatment. If the metabolism is high, the patient should be radiated, using a technic adaptable to her findings.

THE HEART

It is obvious that anatomical changes in the heart muscles are permanent and can not be undone by roentgen therapy or any other type of treatment. A great many of the physiological deviations from the normal can and will be rectified. The heart rate, when there is a normal rhythm, will return to normal. Where there are only paroxysmal attacks of auricular fibrillation, these will disappear and the heart rhythm remain normal. We have had three cases of what was apparently a constant type of auricular fibrillation return to normal and remain normal under successful roentgen therapy.

CONCLUSIONS

1. If all diseases responded to X-rays as does exophthalmic goiter, the practice of roentgen therapy would indeed be a pleasant and satisfactory vocation.
2. It is our opinion that all cases of exophthalmic goiter without pressure symptoms should be treated by means of the X-rays.
3. Most, if not all, cases of exophthalmic goiter can be permanently cured by X-ray therapy.
4. Previous operation is no contra-indication for X-ray therapy.
5. Any hyperfunctioning thyroid should be treated by radiation. The results are not as conclusive as in the exophthalmic type, but a great many can be cured.
6. Treat no goiter until you have had a metabolic determination, and then maintain constant checking.
7. Patients with a metabolic rate of 25 or less should be kept under observation before treatment.
8. The amount of radiation necessary is determined by the metabolic rate.
9. Patients should be examined at intervals following treatment, checked by basal metabolism determination.

X-RAY, THE TREATMENT OF CHOICE FOR TOXIC GOITER [1]

By KENNON DUNHAM, M.D., CINCINNATI, OHIO

MY argument for the treatment of toxic goiter by the X-ray is based upon twenty-two consecutive years' use of this procedure. In my hands and in the hands of my associates, it has given results which are nothing short of marvelous. I consider X-ray therapy the treatment of choice.

When considering the treatment of such a broad and ill-defined class of patients one may easily be misunderstood, unless some definition or description of the cases is given.

The cases which we class as suitable for this treatment must have a rapid pulse when resting and a definite increased basal metabolic rate of plus 12 or more, associated with some of the other symptoms such as fine tremor not limited to the fingers, tachycardia, profuse perspiration as shown by warm, moist palms, and some marked nervous manifestations, as frequent winking, change of disposition or unusual energy without continuity of purpose. In a marked vagotonic case the pulse may be as low as 80, but this is unusual. Such cases must have other definite symptoms such as a marked increased basal metabolic rate or a definite von Graefe's sign, lacrimation, palpitation, severe sweating or diarrhea. The typical exophthalmic cases with enlarged thyroid gland are easily recognized, and are included. These usually respond quickly. The mild adenomata of adolescence are never included; they do not require treatment other than general medical care and time. If they become severe they are easily handled. No case has come to us too advanced to be included.

I shall not trouble you with statistics, but shall try to convince you of the value of X-ray irradiation by affirming that the cases have not been selected except as I have stated. We have taken them all as they came.

The results have been almost universally good. Until a few years since I was able to say that my results seemed to be 100 per cent successful. Since then we have had two deaths and one case which I believe was scared into an operation by a surgeon. These cases are briefly recorded below.

Some cases have ceased treatment against advice. A few cases have returned for treatment because of some unusual emotion, such as that caused by death in the family or fright. Such cases are easily handled. These represent the only cases which have recurred.

The number of our cases that could in any way be considered failures or have relapsed ever so slightly, is so small as to be almost negligible compared to the great number returned to full health, full weight, full earning power and full enjoyment of life. Nothing is more gratifying than to cure one of these patients, who has not only been miserable but who has turned a whole happy home into misery.

The degree to which these patients may be cured is dependent only upon the amount of permanent damage which has been done to the heart, and upon other coincident diseases.

Again, the number of cases in our series that might be considered failures and those of only partial recovery, including all badly damaged hearts and those cases with coincident disease, are negligible compared to the great number of cases that have received X-ray therapy after previous operation for goiter. The post-operative cases have come to us from many parts of the country, from many surgeons, and from some of the largest surgical clinics in this country.

I know of no case that we have considered cured which has been compelled to, or would consent to, undergo an operation for toxic thyroid.

I realize that this may seem an unscientific approach to a problem which is being

[1] Read before the Radiological Society of North America, at Cleveland, Dec., 1925.

considered in so many different ways by men of acknowledged ability, reputation, and leadership. My only defense is that this empirical therapy works. The best way to convey this truth is a plain simple statement of fact. "Magic" is the only suitable word. Many hundreds of cases from many parts of the country have been treated over more than twenty years, and if my statements—which are very plain—were not true, someone would be in a position to disprove them.

I remember well the old discussion throughout this country as to the therapeutic value of diphtheria antitoxin. Statistics were at variance. They were not convincing, but any physician who had watched the course of even a few diphtheria cases without and a few others with injections of antitoxin, knew its value.

If X-ray therapy could be as universally applied by each physician as antitoxin can, it would be only a short time before it would be as universally used. Extirpation for toxic thyroid would become as uncommon as intubation.

Although our attack upon the thyroid for relief of toxic goiter is empirical, there are many scientific data which go far to rationalize our surgical and X-ray therapy. Most has been said when we point to the cures which have followed the partial destruction of the thyroid. But what activates the gland? Is it emotion, toxins, pathology, increased metabolism or an imbalance of the endocrine system? Oh, there is much we want to know!

We have cases, like the adenomata of adolescence, that are self-limited, reports of cases cured by suggestion, and cases which recovered after medical treatment with quinine or iodine. But surgery or X-ray or radium are the measures to which the profession turns when other methods fail. Of these, radium is the newest. With it, I have had no personal experience. Surgery is the best advertised. At best, it aims at the partial destruction of the thyroid. The amount to be removed must be a guess. Operation has the advantage of being quick; it is not sure—it is not safe, and recovery from it often requires a much longer time than that necessary for X-ray treatments. The X-ray is slow, but it is sure. There is no guess. It is safe. The handling of the case either surgically or radiologically requires unusual technic and a knowledge of the psychology of these cases, as is best developed by the neurologist.

Many cases of malignancy develop after operation on the thyroid. I have never seen a case of malignancy secondary to X-ray treatment of the thyroid. I conclude from this that some of these cases must have been or would have become malignant had the X-ray not been used.

TECHNIC

Ninety K.V., 4 mm. of alum. filter, 12 in. dist., 5 ma., 7 min. exposure. Exposure is repeated at intervals of three weeks. Three areas are treated at each exposure, one over each lobe of the thyroid gland and one over the upper sternum. Area covered: $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. The larynx is carefully protected by lead. Overlapping of the areas is avoided. All three areas are treated at one time, which greatly reduces the possibility of overlapping areas. The largest number of treatments ever given any one patient was 44, over thyroid and thymus, and six over ovaries. The average number of treatments is eleven. This technic gives us our results, but I am not sure that it is the best technic.

Some important points in the management of toxic thyroid cases while under treatment are essential to the cure. Few cases need to be in bed or on a meat-free diet, but all must have extra rest and they must sleep. Luminal is a valuable drug, especially during the first few treatments, when the patient may seem worse temporarily. Hospital care is generally unnecessary, but when you are dealing with toxic thyroid and pulmonary tuberculosis, unusual care is necessary, and each disease reacts upon the other. I have had severe cases of toxic goiter (exophthalmic), with large tuberculous lesions, with cavity for-

mation requiring pneumothorax, that have sufficiently recovered so they could return to work.

You will note that, as a rule, I ray these patients only once in three weeks. It is not good for them to be out of your control for that length of time. If possible, have them return for some specific reason at shorter intervals. Your time and attention will gain their confidence and will enable you to care for their symptoms, such as wakefulness and diarrhea or constipation.

These patients are usually under marked mental stress, chiefly characterized by fear or dread, not of any particular person or thing but an indeterminate fear persists. They are "out of tune" with their surroundings, and your sympathy and understanding is of the utmost assurance. Nothing helps so much as for the doctor to tell them how they feel, rather than to have them tell him. Fright and all great emotions must be avoided so far as possible: they cause exacerbation of the disease. Some of these cases become so mentally unbalanced as to require an attendant, or restraint in an institution. The physician's personal care can avoid many break-downs. It is particularly difficult for the roentgenologist to treat such a case in conjunction with a physician who does not understand this nervous element in the patient. In contrast, it is particularly easy for the roentgenologist to heal such a case for a trained neurologist.

While diarrhea is to be dreaded, constipation is the rule.

You have noted that we treat the thymus. I am sure that this is wise but I am not sure whether benefit is derived from direct effect upon the thymus or by secondary radiation upon the thyroid. Further, you will find that many cases are much worse during menstruation. When this is so and the case is not improving, do not hesitate to ray the ovaries. Temporary menopause is sometimes desirable. If, after operation, the patient is very nervous and the basal metabolic rate is not high, do not ray the thyroid. Relief will come by raying the ovaries and the thymus.

Never tell the patient how long nor how many treatments he will require. You do not know. After six treatments, the patient may be worse—or well. If you miss your guess—and you are almost sure to miss—the patient will lose confidence and become worse. You can promise a cure, but never when.

Do not forget that the larynx must be carefully protected, or your patient may have a hoarseness which will annoy you as well as him.

Avoid overlapping, but be sure to see that large areas are exposed. It is well always to start with very small doses and repeat oftener, because the patient may be shocked at the treatment, not by the ray, and you will be fearful to continue, because some patients react very much to the first exposures.

In conclusion, I recommend that X-ray therapy be given first consideration in the management of toxic goiter of all forms, because it is safe, sure, and sane, and because other endocrine glands may require similar treatment. There may be reasons for surgery, such as time and pressure, in a few cases, but surgery should have second consideration only. It is seldom necessary. I repeat, I have had no experience with radium.

CASE REPORTS

Case 1. Mrs. E. M., age 47, first seen August 25, 1924, chief complaint nervousness.

Patient had her right hand badly squeezed in a wringing machine in March, 1924. Following this accident she noticed that she was very nervous, easily fatigued, and irritable. She remembers no enlargement of the neck before that time. She sleeps poorly, is very easily fatigued, and short of breath on exertion. Her ankles swell at the end of the day. For the last year she has suffered from hot flashes. Menses are still regular. She has persistent headaches above the eyes, and occasional

attacks of dizziness and fainting. Appetite is poor. She frequently feels nauseated and vomits. Bowels are regular. She has persistent cough, with excessive white frothy expectoration.

No past history of serious illness. *Family history:* One daughter died of tuberculosis at the age of sixteen; one son and one daughter living and well; husband died of typhoid fever.

Physical examination: Pulse 160. Blood pressure, 120 systolic; 80 diastolic. Thyroid large on both sides. Very marked tremor to outstretched hand. Heart irregular in rhythm; sounds are weak but no murmurs heard. Determination of basal metabolic rate was not possible because the patient was unable to go through with the test.

Seven treatments were given between August 25, 1924, and January 19, 1925. The patient gradually became less nervous, but the heart action remained rapid and very irregular. In December her condition became such that it was necessary to remove her to a hospital. She became extremely short of breath. The heart showed evident signs of dilatation and decompensation. Patient died January 20, 1925, from decompensated heart.

Case 2. Miss E. Y., age 22, first seen on October 13, 1921. Patient was complaining of nervousness, indigestion, and sleeplessness.

Determination of basal metabolic rate showed plus 105. Pulse 120. There was marked tremor to the outstretched hand. Thyroid gland was very large.

Routine X-ray treatments over the thyroid were immediately instituted. Seven treatments were given between October 15, 1921, and March 8, 1922. On March 1, 1922, determination of basal metabolic rate showed plus 46. She was still nervous; pulse ranged from 92 to 100.

The patient incidentally accompanied a friend to the office of a surgeon, who noticed her neck and urged her to have the goiter removed. She was operated upon April 29, 1922. When last seen, June 19, 1922, she had made a good recovery from the operation and stated that she was feeling very much better but not entirely well.

Case 3. Mrs. I. B. J., first seen May 21, 1925; chief complaints are weakness and shortness of breath.

Present illness: Patient first noted nervousness and weakness about February, 1925. She had five X-ray treatments for goiter, administered by Dr. Lange, the first one given in March, 1925. For the two months previous to present examination she has been feeling very badly, with nervousness, weakness, and shortness of breath. She has headaches above eyes; occasional head cold, with nasal discharge. She has frequent sore throats, with hoarseness. Sleeps well, but is extremely nervous during the day. Has a dry cough, no expectoration, no blood spitting. Extremely short of breath and tires on slight exertion. Appetite fair. Has lost fifteen pounds during past year. Urination normal. Menses ceased two years before present examination.

Physical examination: Pulse 120; very irregular. Blood pressure 130 systolic; 90 diastolic. Temperature 98.6. Tonsils are small, congested and look bad. Teeth appear worn; only the upper front and two molars remain; few lowers have been removed. Cervical nodes not large. Eye reflexes show pupils to be normal. Thyroid large. There is very marked tremor to the outstretched hand. At examination of heart no murmurs are heard. There is a total arhythmia to the beats. Lungs negative. Abdomen negative. Metabolic test was unsuccessful due to the condition of the patient.

X-ray examination of chest: Bony framework moderately large and heavier than average for a woman. The ribs are somewhat contracted, suggesting thickened pleura at both bases, but pleura seems to be thickened over both uppers. Trachea appears to be pushed to the right by the aorta. The aorta is broad and the heart is enlarged to the right. *Right lung:* There is a haziness of linear markings of the up-

per right and this contains some calcification. There is a haziness at right base. *Left lung:* Slight changes mesial border, linear markings, first interspace trunks and haziness left base.

X-ray diagnosis: Pleurisy at both apices and enlargement of the aorta. Changes in the myocardium and possible slight tuberculous lesions at the apices. These are probably not active. The basal lesions are probably vascular in character.

Blood Wassermann negative.

Diagnosis: Auricular fibrillation; hyperthyroidism; infected tonsils.

Three X-ray exposures were made over the front of the neck on May 23. On June 2, one X-ray exposure was made over the back of the neck. Shortly after this treatment the patient's condition became so serious that it was necessary to remove her to a hospital. While there, the heart condition became more aggravated. Within a week she developed hallucinations and was irrational. She died of exhaustion and cardiac decompensation in the first week of July.

Note: This represents a case where the heart was greatly damaged at the time our treatments were begun. It must be regarded as a practically hopeless case from the onset of our management.

DISCUSSION

DR. A. C. CHRISTIE (Washington, D. C.): There are a few things that I would like to emphasize in what has been said; in the first place, a remark of Dr. Lahey's that I think is of very great importance, whether we are to treat the disease by surgery or by the roentgen ray, and that is the question of diagnosis. It is certainly of vital importance to us to make a correct diagnosis before we begin treatment, and I think that applies especially to the roentgenologist. The diagnosis is of especial importance because it has been our experience that toxic adenoma, which was separated from other varieties of toxic goiter by the work of Dr. Plummer and his associates, is not nearly so well adapted to roentgen treatment as exophthalmic goiter, and the mortality in the surgical operations for the removal of toxic adenoma is relatively low. In most cases it is therefore a surgical disease, and for that reason it seems to me very important that the roentgenologist should differentiate it from the hyperplastic or exophthalmic goiter. The cases we have treated of toxic adenoma have been mostly cases in which operation was contra-indicated, either because of age or cardiorenal complications, or perhaps because of the refusal of the patient to be operated upon, but certainly our results have not been nearly so brilliant as in the treatment of exophthalmic goiter.

I would also like to comment upon the use of Lugol's solution. We have found no constant results in its use so far as our own work is concerned. Some of the patients have responded very definitely with a drop in the basal metabolic rate, and are seen to be better cases to carry on with the roentgen treatment than others, whereas other cases seem to be actually made worse by the administration of Lugol's solution. We certainly have had no constant results with it but have been encouraged in its use in the hope of rendering our patients less toxic while we were administering the roentgen treatment.

It seemed to me when I was called upon to discuss the papers of this symposium tonight, that I could show the results that we have obtained in the roentgen treatment of exophthalmic goiter better by showing you the abstracts of a few cases, which I shall do very briefly. I have epitomized them on these slides so that you can see something of the results that we have obtained. My associate, Dr. Groover, and I began the treatment of exophthalmic goiter by the roentgen ray seven or eight years ago, very skeptically and very cautiously, but we have been convinced during the time we have been giving this treatment, of its efficacy.

The following abstracts of case reports represent several different types of the disease with regard to severity and response to treatment.

Case 1. Female, aged 21. Date, Dec. 28, 1922. Enlargement of thyroid of one

year's duration; marked tremor; excessively nervous; insomnia; no exophthalmos; pulse 142; B.M.R., plus 75 per cent.

Number of treatments, 4. Duration of treatment, 3 months. Present condition: Patient has been entirely free from symptoms since April, 1923. B.M.R., plus 8 per cent.

Case 2. Female, aged 28. Date, March 25, 1923. Symmetrical enlargement of thyroid which has been present for many years; no exophthalmos; tonsils removed four years ago; 24 pounds' loss in weight; poor appetite; insomnia; pulse 92.

Number of treatments, 3. Duration of treatment, 2 months. Present condition: Has felt perfectly well since July, 1923. B.M.R., minus 2 per cent.

Case 3. Female, aged 50. Date, March 7, 1923. Moderate thyroid enlargement; marked exophthalmos; tremor: pulse 115; loss of weight; B.M.R., plus 71 per cent.

Number of treatments, 9. Duration of treatment, 12 months. Patient returned to work after 3 months. Present condition: Slight thyroid enlargement; no exophthalmos; no tremor; pulse 85; has gained 12 pounds; B.M.R., plus 5 per cent.

Case 4. Male, aged 53. Date, December 4, 1922. Marked thyroid enlargement; exophthalmos; tremor; rapid, irregular pulse; B.M.R., plus 32 per cent.

Number of treatments, 6. Duration of treatment, 7 months. Present condition: No thyroid enlargement; slight exophthalmos; pulse 76, regular; no tremor. Gain of 30 pounds in weight. B.M.R., plus 9 per cent. Has attended to his regular duties as shipping clerk since March, 1923.

Case 5. Female, aged 31. Subtotal thyroidectomy for typical exophthalmic goiter of two years' duration. Five months after operation thyroid enlargement recurred; exophthalmos was marked; nervous symptoms and tremor severe; pulse, 124; B.M.R., plus 45 per cent. Received three roentgen treatments over a period of two and a half months, with reduction in thyroid swelling, disappearance of exophthalmos, tremor, and nervous symptoms. B.M.R. now 12½ per cent and patient looks and feels perfectly well.

Case 6. Female, aged 43. Date, July 28, 1923. Weakness and loss of 30 pounds in weight; nausea, vomiting and diarrhea; marked tremor; insomnia; moderate enlargement of thyroid confined mainly to right lobe; no exophthalmos; pulse 120; B.M.R., plus 50 per cent.

Number of treatments, 4. Duration of treatment, 2½ months. Present condition: Has regained original weight and 20 pounds additional. Looks and feels perfectly well. Has been able to do all her own housework since November 1, 1923. Enlargement of thyroid greatly reduced. Pulse 68; no tremor. B.M.R., 0 per cent.

Case 7. Male, aged 45. Date, May 17, 1921. Exophthalmic goiter of very severe type. Marked exophthalmos; weight 135 pounds; excessive tremor; insomnia; pulse very rapid and irregular. B.M.R., plus 133 per cent.

Number of treatments, 7. Duration of treatment, 5 months. Patient was very hoarse for several months but this eventually disappeared. Now weighs 210 pounds and does full duty as police patrolman. No enlargement of thyroid. Looks and feels perfectly well. B.M.R., plus 15 per cent.

Case 8. Female, aged 44. Date, October 31, 1923. Marked symmetrical enlargement of thyroid; moderate exophthalmos; pulse 116; dyspnea on exertion; marked tremor; B.M.R., plus 78.

Number of treatments, 4. Duration of treatment, 2½ months. Present condition: Has attended to regular work since January 2, 1924. Eats and sleeps well; no tremor; thyroid enlargement definitely reduced; no exophthalmos; gain of 16 pounds in weight; pulse 72; B.M.R., plus 12 per cent.

Case 9. Female, aged 18. Date, November 13, 1922. Duration of symptoms, 9 months. Tonsils removed in previous July. Dyspnea on exertion; marked tremor; insomnia; slight loss of weight; moderate exophthalmos; moderate symmetrical enlargement of thyroid; pulse 128; B.M.R., plus 72.

Number of treatments, 4. Duration of treatment, 2½ months. Present condition: Has been entirely free from symptoms since February 1, 1923; has married and borne one child and has done all of her housework; gain of 35 pounds in weight; no exophthalmos; no thyroid enlargement; no tremor; B.M.R., plus 10.5 per cent.

I have not shown these slides in order to prove the efficacy of the roentgen treatment in a great number of cases, because a few cases will, of course, not do that, but each of these cases does represent a considerable number of cases of like age and like severity of symptoms, and together they indicate the regularity and constancy with which the results have been obtained. Our experience has brought us to a very definite conclusion: that the roentgen treatment does permanently cure exophthalmic goiter.

Now with regard to the statistics we are able to show,—it is only now that the roentgen therapist is beginning to be able to show a considerable body of statistics to prove his contention. Before, it has been only the regularity and constancy of the results we have obtained that have made us persist in this method of treatment. Up to the present time we have been very much in the position the surgeon was in from 1900 to 1905. I remember very distinctly attending a meeting of the Academy of Medicine in this city in 1903, when both Dr. Crile and Dr. Mayo read papers on the surgical treatment of exophthalmic goiter, and were almost unanimously and severely criticized for using and advocating surgical treatment. Their critics were medical men who recommended medical treatment. The surgeon at that time had no body of statistics to depend upon; he was convinced that he had a method that was curing a certain number of cases. In spite of the fact that he had a mortality at that time ranging from 16 up to almost 40 per cent, he was able to persist in the use of his method of treatment. If the same reasoning had been used then in regard to surgical treatment as is used today with regard to the roentgen ray, namely, that we have no great body of statistics to prove our case, I think it would have been very difficult to have persisted conscientiously and persistently in the surgical treatment. While we are talking about statistics and considering curability, it is important to emphasize this fact, that roentgenologists as a rule do not claim 100 per cent cures in this disease, and to emphasize the further fact that the surgical statistics do not show 100 per cent cures.

It is very well known, although not very greatly emphasized, that the statistics that are available so far, show about 66 to 70 per cent of permanent cures from the surgical treatment of exophthalmic goiter. Those are the figures from the Mayo Clinic, and the only ones in which a thorough study has been made of cases that have gone a number of years after operation. There are other available statistics to show about that percentage of cure from surgical treatment of exophthalmic goiter and a larger percentage, between 80 and 85, of cures of toxic adenoma, and a certain other percentage of cases have been improved in their symptoms, but not permanently cured by the surgical treatment.

Now that is what surgery has to offer so far as the statistics show, up to the present time, and that is about what the roentgenologist has claimed since the year 1915, when Pfahler first made the statement that he believed that the roentgen rays would cure about the same percentage as cured by the best surgical treatment. We think we are in position to-day to pretty definitely prove that assertion, that the treatment, done skillfully and with the patient under good management all the time, will cure about the same number of cases as can be cured by surgery in the best hands.

I would just like to pay my respects in passing to a method of making surgical statistics that is somewhat going out of fashion, and that is the business of making surgical statistics upon the number of operations performed and not the number of cases operated upon. For instance, the surgeon operates a thousand times and has what he says is 1 or 2 per cent mortality,

whereas he has operated the thousand times perhaps only on three to five hundred patients. By the simple device of increasing the number of operations upon each patient the mortality rate is lowered. Now that has been a method of reporting surgical statistics that a great many people have passed over casually, coming to believe that the mortality rate in surgical dealings with exophthalmic goiter is much lower than it actually is. So much for the statistics of the disease.

Let me speak briefly about the objections that have been offered to the roentgen treatment of the disease. Some of them have been offered this evening. One of them, that Dr. Jenkinson spoke of, and which I would like to emphasize and which I do not think is a legitimate objection at all, is the injury that may be done to the skin by the roentgen treatment. If it were a legitimate thing for a surgeon and others to use that as an argument against roentgen treatment, then it would be quite legitimate for me to show pictures of cases that I have seen with large unsightly keloids in the neck following surgical operations for exophthalmic goiter, or a very large unsightly scar following infection of the wound after an operation, or I could possibly show pictures still more gruesome than those; the surgeon's patient may even be dead. I just speak of that as not a legitimate argument against roentgen treatment. Such results are due to carelessness or to more or less unavoidable accidents, and it is certain that they are now very rare.

Now, to the legitimate objections which the roentgenologist must answer. The objection that Dr. Crile has mentioned this evening, that severe and serious cardiovisceral changes may take place while the roentgen treatment is being given certainly is not valid in the mild cases of exophthalmic goiter, and those with a relatively low basal metabolic rate, who are going about their work perhaps and have no very toxic symptoms. Serious visceral changes are not taking place in these patients and they are the patients who can be cured quite promptly by roentgen therapy. Then, with regard to the more toxic cases, those are the very cases which the surgeon himself must prepare for operation and with which he must go through a number of different procedures before he finally gets them prepared for operation, consuming in the process a considerable amount of time. I will read to you from one of Dr. Lahey's papers[1] the procedure he has adopted, not to criticize it, because it is the best surgical procedure known to-day.

"This, then, led us to what we have called multiple stage procedures, the plan which we now pursue.

"The surgical procedure in toxic goiter permits of division into steps, each a block, so to speak, which may be considered a measure of progress, each to be completed in the doubtful cases as a single procedure. The next step is undertaken only after the effect of the first has been noted and the probable outcome of an advance through the next one seriously considered, with the distinct conviction that where doubt exists as to the outcome, only the first step shall be used. The patient is returned to bed, the effect noted, and, if the reaction be not unduly severe, the next step completed within two or three days.

"The various steps, or blocks, then, of these procedures are ligation of the right superior pole, ligation of the left superior pole, ligation of the right inferior thyroid artery, ligation of the left inferior thyroid artery, elevation of the skin-flap, right subtotal hemithyroidectomy, and left subtotal hemithyroidectomy. The application of these steps to a given case will be taken up after the consideration of the next phase through which we have passed."

Those are the procedures that, in the severe cases, often have to be carried out, and certainly that does consume time, sometimes a considerable amount of time. Many such cases can be gotten very promptly under control by roentgen therapy, the toxic symp-

[1] *Surg. Clinics N. Am.*, 1924, IV, 1359.

toms greatly reduced, and they can be carried through to a final and permanent cure. This was well shown in one of the case histories which I gave here to-night of a man seemingly almost *in extremis*, who is back on his beat to-day as a policeman, weighing 210 pounds and with a normal basal metabolic rate.

The question of the production of fibrosis was raised. Dr. Jenkinson spoke of it and Dr. Crile gave the instance of a patient who had had a severe atrophy of the skin with immense fibrosis underneath the skin, but he drew from that the conclusion that roentgen therapy had a selective action on the skin, or else that the thyroid came back to its function more rapidly than the skin rejuvenated itself. The roentgenologist would conclude either that the patient had been given too large a dose of roentgen rays or that it had been continued over too long a time. Dr. Jenkinson described quite in detail the proper method of treatment, a method that does not injure the skin, because injury of the skin is not necessary. We have found out that it is not even necessary to produce telangiectases, which occurred so commonly in the early days of our treatment when we were producing erythema.

Now in regard to hypothyroidism. If this ever was an important question in roentgen treatment, it has ceased to be. By the control of the cases with the basal metabolic rate, there is no reason for producing it. I never have heard from anybody of cases of myxedema that they have seen after roentgen therapy, and I have never seen in the literature or had in my own experience any symptom of the tetany that would indicate that the parathyroid had been injured by roentgen treatment.

The argument that the patient loses more time from this method than by surgical treatment doubtless may be true in isolated, serious cases, but in the total number of cases, the average loss of time of all the patients treated, I believe, is considerably less after roentgen treatment than after surgical treatment, because of the fact that a great many of the milder cases can continue about their everyday duties while the roentgen treatment is being applied. That is one of the recommendations of roentgen therapy, that the patients can continue about their everyday duties. It is a warning that needs to be given the roentgenologist, however, that the patients must be kept thoroughly under his control all that time, and if it does seem necessary for them to be put to bed, he should see to it that it is done. The day has gone by when a doctor may refer a patient to a roentgenologist and expect to direct him to give this patient a certain number of roentgen-ray treatments over his thyroid gland, and expect the roentgenologist to assume only the responsibility of giving those treatments. We may assume the responsibility of either taking care of the management of the case ourselves, or being definitely certain that the internist is looking after the welfare of the patient in every detail,—medicine, if necessary, rest and hygiene, and the regulation of the home life. We found out once by accident that the internist was actually giving the patient thyroid extract while we were giving him roentgen treatments for exophthalmic goiter.

The claim made to-day, then, by roentgenologists is that we believe we have fairly definite proof that we can cure about the same number of cases of exophthalmic goiter that the surgeon can cure by surgical methods, including ligations, and subtotal thyroidectomy.

Now if we could offer no more than that there would be no reason for changing from surgical treatment to the roentgen treatment, nor any reason at all why we should advocate the latter. The reason we do advocate it is that there is a certain mortality attendant upon the operation upon the thyroid gland in exophthalmic goiter. This question of mortality has been somewhat minimized, but there is no doubt in my mind that it continues to be an important question and it serves no good purpose for us to evade the facts; we are dealing with a condition and not a theory. With regard to the patients scattered over the country, it is not

possible, however desirable it may be, for all patients to be treated by Dr. Crile or Dr. Lahey or at the Mayo Clinic or any other great clinic in the country. The great majority of the patients are being treated by surgeons scattered all over the United States, surgeons of varying abilities; we must depend on the surgeon in our home town in the great majority of cases. I will read to you, so that we can get this well in mind, what the surgeon considers the ideal of the surgical treatment of goiter to-day, and I must submit to you that it is not a practical thing so far as the majority of patients are concerned. I am quoting again from Dr. Lahey:

"We maintained that all goiters should come to our hospitals, where we were particularly equipped for the care and management of these cases; that they be anesthetized only by our own anesthetist, trained and experienced in the administration of gas oxygen to these cases, trained and experienced in the management of the urgent conditions which occasionally arise in the surgery of toxic goiter; that they be operated on by a non-rotating group as far as the important members of the operating team went, and that their after-care be in the hands of this same group plus a group of nurses trained and experienced in the post-operative handling and management of goiter surgically treated, a factor which I assure you has played no small part in maintaining the low mortality rate which we have been able to obtain."

We have no doubt that the mortality rate can be reduced to what it is in Dr. Lahey's clinic, where he says it is 1.7 per cent for exophthalmic goiter, and in the Mayo Clinic to approximately 1 per cent, but any of you who have come in contact with many of these cases in your own town and have seen them operated upon, know that the mortality rate among the average good surgeons of this country is much closer to 5 per cent than to 1 per cent, and that the average mortality among all surgeons in the country is in all likelihood at least 10 per cent.

Dr. Henry Hulst (Grand Rapids, Mich.): The chief problem before the jury to-night is, Shall we operate or shall we use X-ray therapy? After listening to the advocates pro and con for each method, there remains very little to be said that will have any influence so far as the ultimate decision of this question is concerned. I do not think it will make very much difference, anyhow, what the arguments are. Most of us come provided with an apperceptive mass, as psychologists call it. Most of us come well provided with bias, a hard thing to get rid of. I do not know that it is necessary to get rid of it. As I was listening to the discussion I thought to myself, "Is it possible to evaluate those two relative methods? Is it at all possible to evaluate those methods when we take them entirely by themselves? Does not roentgen-ray therapy include more than roentgen-ray therapy? And are we not likely to ascribe to it results which are not due to it alone? On the contrary, is not the same thing also true of surgery? Those of us who are familiar with the writings of Dr. Crile are well aware that he is not only a brilliant surgeon but a master psychotherapeutist. I do not suppose he would care to be called a hypnotist; that is not a very complimentary term to use in an audience like this. However, he has gone out of his way to show us that mere surgery is not enough; rest and psychotherapeutics not only add to the comfort and success of the case, but even, no doubt, contribute to the low mortality rate which he claims. Perhaps we roentgenologists might well profit by the technic used by surgery, at least as in the hands of Dr. Crile, and add some of these methods to our own. That psychotherapeutics is a large element in the surgery of several clinics, there is no doubt, even where it is unconsciously resorted to, for many people are unconscious psychotherapeutists. Take, for instance, this: "Here was the bunch; now it is gone. You ought to be relieved of your symptoms; you haven't any business to have symptoms any more." Besides that, almost every large

clinic has an atmosphere—I heard the other day that every person has an aura. I don't know about that, but I am sure that every clinic has an atmosphere which is produced by the personalities that dominate the clinic. Now, there is something dominant about surgery itself. Genetics has familiarized us with the idea of dominance and recessiveness. The same thing applies to medicine. The surgeon appeals to the imagination; his work is dramatic; he usually represents the man of positive character, the man who is not recessive, and he usually dominates the situation. Don't forget that. That is a very important element in the care of these patients. These thyroid cases for a long time were looked upon as really not surgical, but neurological. I mention this because this point was touched upon, but not broadly; also because I have been interested in that side of the subject for a long time, though perhaps more interested in the roentgenological treatment of cases of toxic goiter. My own experience I shall not go into except to state briefly that this treatment has been very favorable. I have pursued this method now for over twenty years, with nothing to regret. I have not cured every case. Some have even died. I had one case originate and die within three days. Now, with Lugol's solution perhaps we might have been able to save some of those cases. However, it was my good fortune before I ever used the X-ray to hypnotize four thousand people. I know something about psychotherapy. I am not using it extensively now, especially as I do not like to be called a hypnotist. When Bernheim was asked about hypnotism, he said, "There is no hypnotism"; yet he hypnotized more people than anybody else. Perhaps some of our surgeons might say, "There is no hypnotism." "Suggestion" is the word we are all familiar with, but because of the familiarity with the word we are probably less familiar with the phenomena associated with it. *Ordinary* suggestion is very effective. A man by the name of Coué has been going through the country of late and has convinced some thousands of the public, at least, that a great deal can be accomplished in that way, but let me tell you that a great deal more can be accomplished by suggestion in hypnosis. Hypnotism is nothing but the exploitation of suggestibility. That is all it is. I mention these things, not because I want you to hypnotize your patients —I do not do that myself now — but in order to accentuate what Dr. Crile has always stressed. There is one thing that often stands in the way. In our large clinics these cases are simply referred to the roentgenology department; it is asked to ray the patient. The roentgenologist does not come into very personal relation with the patient. He has no opportunity to use suggestion. The private physician, to whom the patient comes, and who has full charge, is in a much more favored position. But a clinic such as the Mayos', Crile's, and others, with their tremendous atmosphere of the advantage of surgery as compared with the X-ray—it would have to be a very fine hypnotist, he would have to use very expert suggestion, in order to be able to overcome such an atmosphere!

And yet I think we should not despair. It is a mistake simply to go at a case and pour the X-ray into it with the idea of performing a sort of micro-surgical operation in imitation of macro-surgical operations with the knife. All of these cases require to be carefully managed, and when we do we shall get results such as we do not dream of otherwise. I think it was Theodore Kocher who called exophthalmic goiter "thyroid diarrhea." Somebody else has called diabetes "liver diarrhea." I do not believe that exophthalmic goiter is simply hyperthyroidism; I do not believe that toxic goiter is simply hyperthyroidism. I believe that the symptom complex dominates the picture to such an extent that we are likely to forget the rest. We are likely to forget not only that we do not have the ideal treatment in either surgery or X-ray, and that we do not know what is the matter with the patient when he has exophthalmic goiter or hyperthyroidism, and I hope that somebody will do something similar for this

"thyroid diarrhea." Why not? I remember saying a few years ago, in a paper, "The time is coming, and it is almost here, when somebody is going to isolate from the pancreas a substance which, when administered by the mouth or injected hypodermatically, is going to control diabetes." Banting furnished this. Now we can say, similarly, that there is a something somewhere, which, when administered hypodermatically, will control the hyperthyroidism of exophthalmic goiter. Many of us are well aware that by surgery and by roentgen therapeutics we only palliate, and when we get through with a case we flatter ourselves by saying, "My patient is cured." Yes, cured so far as appearances are concerned, but the physiologist would not be satisfied. He knows that there is more that should be done; just what it is, he does not know. Plummer admits it, the surgeons admit it, but we do not sufficiently realize it. While we go on using the X-ray and using surgery, we should bear this in mind all the time, and look out for the real thing which is coming.

Dr. C. D. Chapell (Flint, Mich.): Someone has said that America has had only one George Washington. We, as physicians, appreciate the fact that we have only one George Crile and only one Chevalier Jackson. According to the discussion which I have heard over this subject, I wish to say that I have perhaps been more fortunate than some of my colleagues in that I have had the aid of competent surgeons and internists, who started me off in this work about eight years ago, by sending me their cases of toxic goiter with request for X-ray therapy. At this time, I took up the work, in the way that Dr. Witherby started. Since that time I have, of course, radically changed my technic and method of handling patients.

The psychological factor in the condition of the patient is the one thing that apparently has been neglected by a great many men in the treatment of this disease. When patients are referred to me I profit by Dr. Crile's teaching, and make no attempt to put them on the table for treatment until they are quiet, and anxious that the treatment should be started. I never attempt to treat a patient who is nervous, irritable, or frightened, and I find that this has a very real bearing on the outcome of the particular case. At the present time, I am selecting my cases, and treating only that type of goiter which is a non-surgical risk, and in which I find, in addition to the clinical symptoms, a relatively high mean blood pressure, with a high metabolic rate. Those cases that come to me with a low basal metabolic rate, and a low blood pressure, are the ones with which I find I have the most difficulty. Looking over the number of cases treated, I find that my pulse pressure usually ranges from sixty to eighty, with a low diastolic reading as well as a high systolic rate, and with a basal metabolism varying from twenty-seven to one hundred and eight.

As to technic, I treat each case individually, using as an initial dose, a 30 ma. minute exposure over right and left lobes and the thymic region, through $2\frac{1}{2} \times 3$ inch portals, at a 10-inch target skin distance, at 126 P.K.V., this corresponding in my locality to an 8-inch parallel spark gap, with 4 mm. of aluminum filter. I have the patient return every three weeks, at which time I have a basal metabolism test taken after at least fourteen hours, and not more than eighteen hours, fasting rest, and again take the pulse pressure rate. If I find these to be lower I repeat the same dose over the same areas, estimating this as the therapeutic dose. If there has not been an appreciable improvement in the condition, I add five milliampere minutes more to each area. My results have not been 100 per cent by a long way, but since more careful selection of cases, my percentage has rapidly mounted.

It would be unfortunate, I think, at this time to enter into controversy with, or try to antagonize, the surgeon or internist, as I believe that only by a hearty co-operation

between all three, are we going to find a way out of this maze, and hope to discover the best remedy for this dreadful disease. Personally, I use radium on bed patients only, or in those who are extremely nervous, and to whom a trip to the X-ray department would be an unnecessary ordeal. I have used both methods, and do not see any difference in the results.

DR. GRAHAM (closing): When I was asked by Dr. Nichols some months ago to address this meeting, I undertook experiments in the laboratory to determine the effect of X-ray irradiation in measured doses upon the thyroid of dogs. I regard the experiments, however, as of no particular value for the following reasons:

1. The position and mobility of the dog's thyroid is much more variable than that of man.

2. Any information concerning the effects upon the thyroids of dogs with simple endemic goiter would not necessarily have any bearing on the thyroids of man with toxic goiter.

Dr. Crile asks, "What has been the experience in regard to patients who have been treated moderately, mildly, and extensively by irradiation, so far as changes in the thyroid gland itself are concerned?" In the routine examination of thyroid removed at operation, I have been unable to distinguish between glands that have been irradiated and glands that have not been irradiated.

DR. CRILE (closing): I am sure my colleagues on the surgical side have discovered to-night that among the many merits and qualities of the roentgenologist, he also is a wonderful debater. Like Dr. Hamilton, I have very much appreciated the discussions. I am sure that the best we can do is to continue the accumulation of statistics and of experience and the improvement of our records, so that, as time goes on, we shall eventually reach a satisfactory conclusion regarding this matter. Now this is certain, as Dr. Christie has pointed out, that it takes a considerable length of time actually to establish our results and it is very difficult for the surgeon to make a statistical statement of exactly what he has accomplished. It is difficult properly to evaluate many things, whether in surgery or radiation, but as far as the surgeons are concerned, this meeting and the discussion have been most welcome because you have shown us your results, and have given us a very fine bogey to play against. For myself, I think that the whole question will be settled in due time but it will be settled not so much upon the basis of what we hope for as upon the definite facts brought out, and such meetings as this will do an enormous amount of good in ushering in the arrival of the day when we shall have a clear-cut understanding of what the problem is and what can be expected from one or the other form of treatment, or from both together.

DR. FRANK H. LAHEY (closing): I, like Dr. Hamilton, have purposely avoided controversy, but after hearing the present discussion, and being Irish myself, I am reminded of a fellow-countryman in Ireland, who came along a street and saw about twenty-five people in a free fight in the middle of the street. One of the contestants withdrew from the riot to sit down on the curbstone and rest, and the Irishman went up to him and said, "I would like to know whether or not this is a private fight, because if it is not and there is no objection, I would like to get in it."

Now, of course, the first thing I have to do is defend what I write. It is only fair to say that I have written a great deal that I have had to take back, and I hope that I will have to take back a great deal more, because that is a sign of progress both on my part and on the part of medicine in general. These statements about multiple stage procedures, quoted by Dr. Christie, were written a year ago on statistics based on the year before that. Of this, Dr. Christie said nothing. This year, out of 754 goiters, we have ligated only one, so the plan of multiple stage procedure, especially as it involves

a large percentage of cases, has been largely given up, due to the pre-operative use of iodine. Dr. Christie speaks of a seven-stage procedure. Yes, such a procedure was once done upon a patient who had been discharged by a roentgenologist, turned over to us, and gotten well by a seven-stage operative procedure. She had been in the hospital, bed-ridden, vomiting, had diarrhea, and was approached through these multiple stages because it seemed to us that this was the only possible way to save her.

We have had, in Boston, advocates of X-ray treatment of exophthalmic goiter, for instance, Holmes and Means, and we wish, first of all, to state that we believe that their cases were carefully selected, that their patients really had thyroidism, and that they really cured some of them. We do not debate this point. We do think, however, that as we go on from year to year, this question will certainly be settled with the progress of time, the development of truth, and the demonstration or lack of demonstration by either group of a large number of cases cured. If X-ray can consistently show as large a percentage of cures as surgery can to-day, no one will disagree with its usefulness.

This fact remains, and I do not see how anyone can overlook it, that up to the time we had Lugol's solution, there were more patients who died in the hospital, before they could be operated upon, from intense thyroidism than died following operation.

Do not neglect the fact that in a thyroid clinic there are a definite number of patients every year dying medical deaths from hyperthyroidism. If you can do something immediately to relieve this, to interrupt the degree of toxicity, to protect the cardiac apparatus, then you are justified in going ahead with this group with X-ray treatment. If you cannot, you must do something actively to interrupt toxicity.

There are a number of things I would like to say regarding pathology. Dr. Graham has well brought out that the question of pathology in thyroid is very uncertain to-day. It is true, as he states, that the pathological report of malignancy is proven only by continued observation, and is based wholly on whether or not the patient has a recurrence of growth or metastases, and death occurs. Therefore, some of the cures which are claimed in surgery and X-ray may very well be on patients who do not actually have malignancy. Certainly it is our experience that where malignancy has penetrated the capsule of adenoma involved, as it does the deep clavicle lymph nodes and adjacent tissue, every patient of that type to-day, who has come to us, has died in spite of X-ray, radium, or surgery.

I welcome this discussion; it is illuminating to me, and whenever X-ray treatment is able to demonstrate a similar large number of patients relieved and cured of thyroidism, then we will gladly dismantle the surgical clinics and let the roentgenologists have them.

PROBLEMS IN DIAGNOSIS AND TREATMENT OF METASTATIC TUMORS IN THE CHEST [1]

By P. F. BUTLER, M.D., Director, and J. E. HABBE, M.D., Senior Interne, X-Ray Department, Boston City Hospital, BOSTON, MASS.

THE entire field of metastatic malignancy has for some time held the particular interest of the radiologist because of the admirable adaptability of the X-ray film to show the presence of metastases, and, when present, their extent.

The term "silent metastasis" is familiar to all and by its very familiarity is suggestive of the frequency of occurrence of this clinical condition. While metastases to the abdominal organs, spine and long bones may be symptomless, nevertheless these are more frequently associated with ascites, nerve root pains, spontaneous fractures, etc., so that it seems reasonable to assert that the condition of silent metastases is more frequently found with secondary new-growths in the chest than in any other region. Not merely are the symptoms absent but quite often there are no physical signs either, especially when the nodules are deeply seated, hence at some distance from the surface of the chest.

The treatment of metastatic tumors has not yet reached the stage of recognition and wide-spread approval that the diagnostic side has received. Words of caution have been offered by many writers whose experience has included cases receiving moderate or large amounts of radiation over the chest, with unsought-for pleural and pulmonary changes, and the whole subject was well reviewed and some experimental findings summarized by Davis, working recently at the Mayo Clinic. However, with our ever-increasing knowledge of the cancer problem and our broader empirical knowledge of the response to radiation, we do feel entirely justified in treating selected cases of metastatic malignancies in the chest with the reasonable hope of positively benefiting the patient.

[1] Received for publication February 5, 1926.

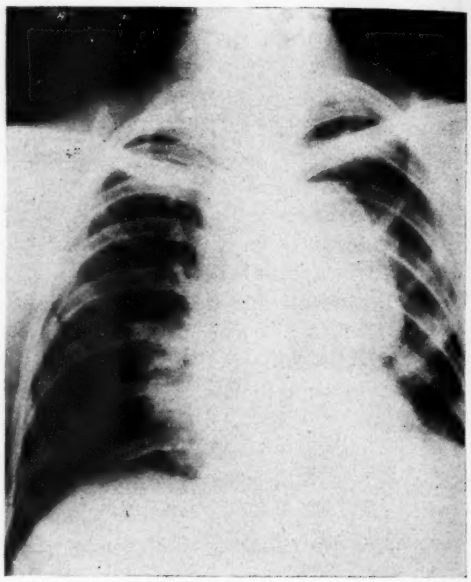

Fig. 1, Case 1. Large, sharply circumscribed sarcomatous nodules occupying both lung fields and lying just to right and left of mediastinum.

GROUP I, CASES NOT TREATED

Case 1. Male, age 50, complaint—painful lump in epigastrium, present eight weeks (no chest symptoms). Physical examination showed two abdominal masses, chest negative. Gastro-intestinal X-ray showed extra-alimentary masses displacing stomach and large bowel. Chest X-ray (Fig. 1) showed large sharply circumscribed nodules to right and left of mediastinum.

Laparotomy was done despite chest X-ray findings. Operative findings: multiple tumor masses with central necrosis and free reddish fluid. Masses not resectable. Patient died twenty-four hours post-operative.

Postmortem: large tumor masses lying subcapsularly involving both kidneys. Left adrenal normal; right adrenal not found, apparently incorporated in mass. Lungs:

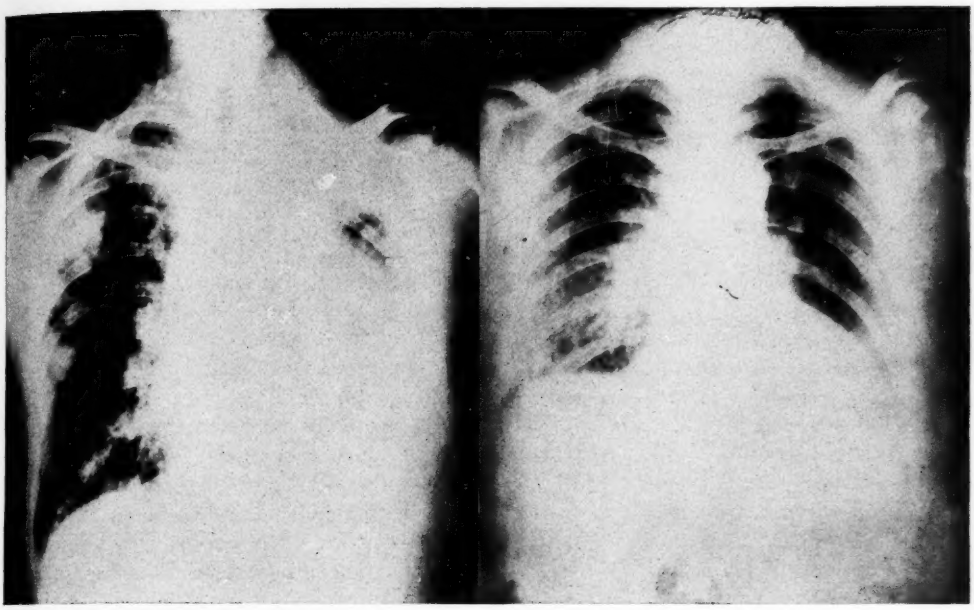

Fig. 2, Case 2. Pleural effusion left; scattered irregularly outlined nodules right; probable metastatic carcinoma.

Fig. 3, Case 2. Chest negative for evidence of old tuberculous disease.

base of right to a slight degree and much of left, particularly upper lobe, involved in a mass of nodular, partially encapsulated tumor cells; the centers of the nodules were reddened, softened and necrotic. Pathological report: multiple hypernephromata, or sarcoma adrenal.

Case 2. Female, age 54, complaint—increased thirst, with associated polyuria (no chest symptoms). Two years ago patient had a mass removed from the left axilla, at which time a pathological diagnosis of carcinoma, probably from aberrant breast tissue, was made. Breasts negative at time of last admission.

Chest X-ray (Fig. 2) showed pleural effusion left, probably of metastatic origin; scattered nodules in right chest, metastatic malignancy. There was some question as to how much of the findings might have been due to an old unrecognized tuberculous process, but, fortunately for differential diagnosis, a film of the same patient taken about six months previously was available for comparison (Fig. 3) and proved conclusively that the present process was entirely a malignant condition.

A film of the skull showed metastatic destruction of the cranial bones.

Case 3. Male, age 56, complaint—cough with blood-tinged sputum, difficulty in breathing, weight loss. Two years previous to admission patient had had an exploratory operation because of repeated hemorrhages per bowel (dark blood).

The gastro-intestinal tract showed no demonstrable disease, but it was noted that the left kidney was about twice its normal size and slightly irregular. Three months before admission the patient was operated on for intestinal obstruction, at which time a kink in the small bowel in the region of the kidney tumor was found and released. At this time the kidney mass was about four times its normal size, definitely irregular, and quite inoperable. A definite diagnosis of hypernephroma was made by the surgeon. For about a month following the second operation the patient seemed to do well; since then, however, weight loss,

cough and dyspnea have become markedly increased. A chest film (Fig. 4), taken several weeks after onset of chest symptoms, showed many metastatic nodules throughout the entire left chest.

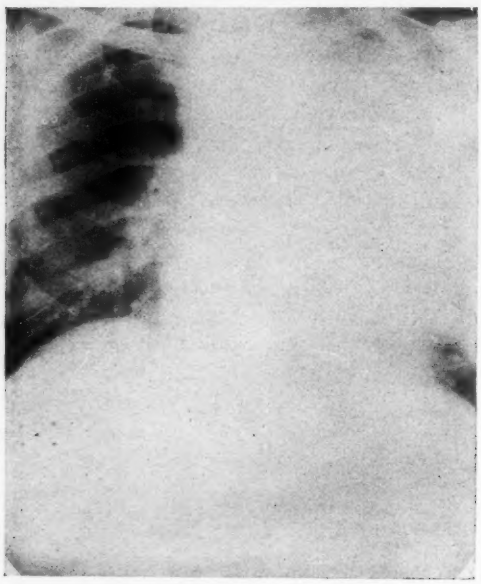

Fig. 4, Case 3. Dense confluent metastatic infiltration; primary tumor; hypernephroma left kidney.

COMMENT

Here were three cases of tumors metastasizing to the chest, the latter two with a fairly definite clinical understanding of the source and type of the primary tumor.

In Case No. 1 there was no opportunity to even consider the advisability of X-ray therapy, although it is quite probable that, if given to this patient, whose general preoperative condition was very good, the nodules in the chest might have undergone encapsulating fibrosis and perhaps even partial regression.

In Case No. 2 the patient was referred for X-ray therapy, but her general weakness and anemia, her freedom from any distressing symptoms, the extensive involvement, and the type of tumor present all seemed contra-indications for therapy. The patient died quite comfortably about six weeks later.

In Case No. 3 the patient was likewise very weak and anemic and was showing frequent small pulmonary hemorrhages, so here again the patient's lowered general resistance seemed a contra-indication to attempting therapy.

GROUP II. CASES TREATED WITH QUESTIONABLE BENEFIT

Case 4. Female, age 45, complaint—non-productive cough. Twenty-six months before admission patient's left breast had been radically removed, the pathological report being carcinoma. For the last two months a chronic cough had been present, which seemed to have followed a simple acute coryza. She had suffered intermittently from chronic bronchitis for as long as eight years, following an attack of influenza. Because of the history of repeated infections she had been treated for more than a month with suitable drug therapy before being referred for X-ray study. By this time a definite infiltrating process in the region of the right ascending bronchus (Fig. 5) and small nodules scattered throughout the entire right chest were seen.

Moderate doses of penetrating rays over the right upper chest through three portals gave partial relief from cough for a period of approximately six weeks, but as the process extended (Fig. 6) shortness of breath became more marked and the general resistance weakened, so further therapy was not given. This patient died of suffocation about three weeks after discontinuing treatment. Postmortem was not allowed.

The character of the metastases in this case, especially in its later stage, represents a double type of involvement, according to LeWald's recent classification of metastatic carcinoma in the lungs, namely, the presence of miliary nodules and the less commonly occurring peribronchial infiltrations.

Case 5. Female, age 41, complaint—pain just to left of spine in mid-dorsal re-

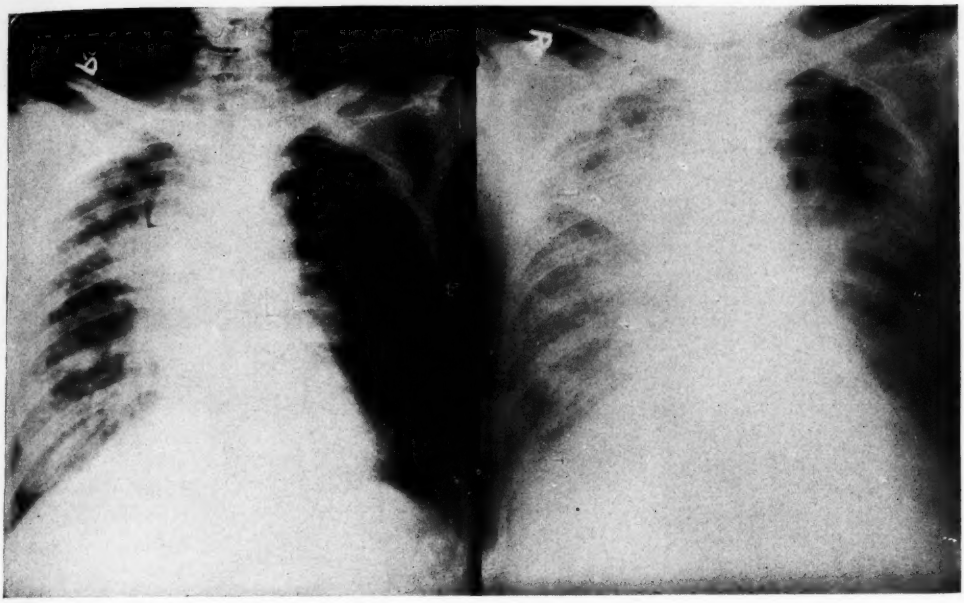

Fig. 5, Case 4. Peribronchial infiltration right upper chest; scattered small nodules throughout entire right lung.

Fig. 6, Case 4. Same patient as Figure 5. Increase in degree of involvement despite X-ray treatment and temporary relief of symptoms. Left chest now shows definite involvement. Interval, approximately two months.

gion posteriorly. Patient had a carcinomatous right breast amputated in January, 1924, followed by two courses of fairly intensive X-ray therapy over a period of three months. Twenty months later a growing lump in the opposite breast was observed. Chest, spine and pelvis films were taken and no evidence of metastases seen, only a density in the lower right chest which had the appearance of either consolidated lung or high right diaphragm, together with visualization of the interlobar septum (Fig. 7). The patient had had recent pain below the right scapula posteriorly and a cough associated with raising phlegm. A week's observation in a surgical ward showed a gradually resolving temperature curve, at the end of which time the remaining breast was radically removed (November, 1925). The immediate post-operative recovery was excellent. Two months later the patient returned, complaining of pain in the left back, mid-dorsal region. Films at this time showed the entire spine and pelvis free from metastatic destruction, but marked thinning of the sixth rib, left (Fig. 8), posteriorly and homogeneous density in lower two-thirds of right chest.

Several rather small treatments over the affected rib through a posterior portal have only partially supplemented the administration of codeine in the relief of pain at this site. From the very beginning of X-ray treatment, immediately after the first breast amputation, this patient has been a difficult one to handle because of the repeated gastric upsets which have always followed radiations. The puzzling problem she presents at this time is the pathology in the lower right chest which is now without symptoms. Is it a "silent" metastatic carcinoma, a chronic pleuro-pneumonitis of infectious origin, or a roentgen pleuritis? Her entire treatment totals less than two erythema doses given in two series and through each of the usual four portals for

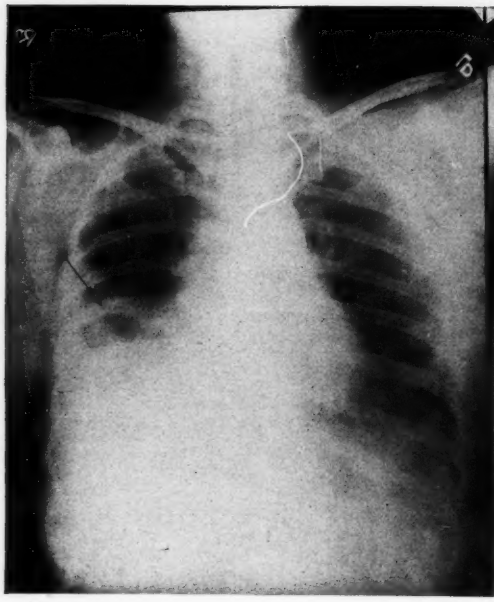

Fig. 7, Case 5. High right diaphragm, movements restricted. Patchy density just above. Interlobar septum visualized.

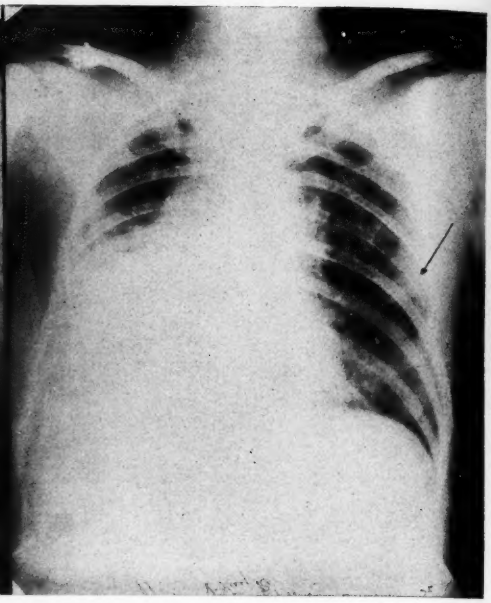

Fig. 8, Case 5. Homogeneous density in lower two-thirds of right chest; metastatic destruction of sixth rib left.

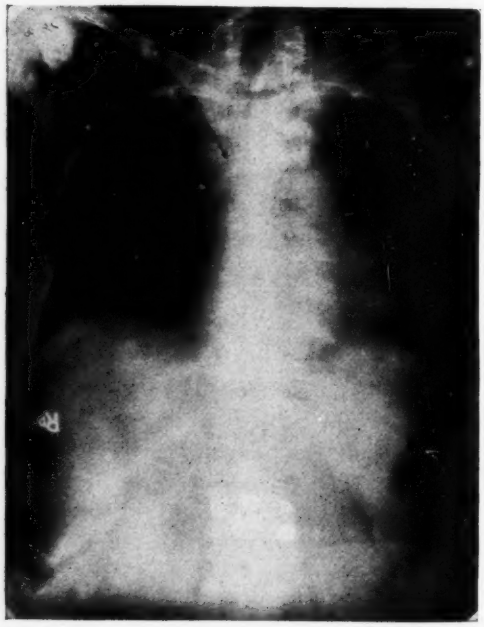

Fig. 9, Case 6. Marked narrowing of fourth dorsal vertebra. Large metastatic nodule behind heart, probably occupying lower left lung.

post-operative breast carcinoma, and these were given almost a year and a half ago.

Two thoracenteses have yielded no fluid, yet this result was the expected one clinically, since, on physical examination, there was no area of absolute flatness such as would be expected with a moderate sized effusion, tactile fremitus was diminished but not absent, and the breath sounds were distant but heard throughout.

In favor of the density being a roentgen pleuritis we have the facts that the patient has consistently shown systemic reactions (nausea and vomiting, although no skin reactions) following treatments, has had a suggestive clinical picture of fever, pain in lower right chest, and productive cough over a period of about ten days, all of which subsided before her second operation, and now shows the X-ray picture of pleural and pulmonary involvement over the treated side, with probable slight retraction of mediastinal contents to this side.

Contrariwise, there had been no X-ray treatments over the chest for a period of

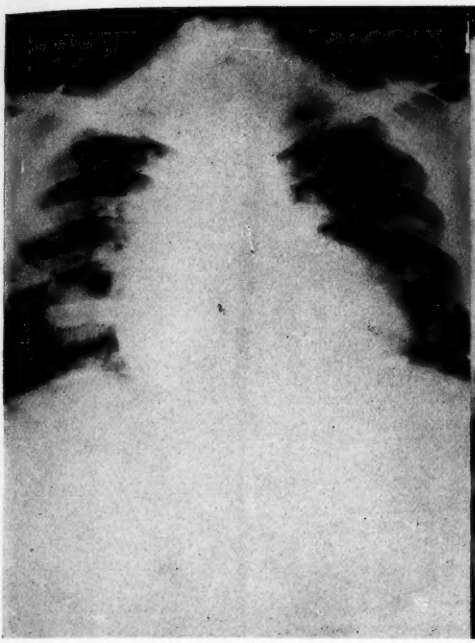

Fig. 10, Case 7. Solitary pulmonary metastasis present four months, small treatments with no change in size during that time; hypernephroma left kidney.

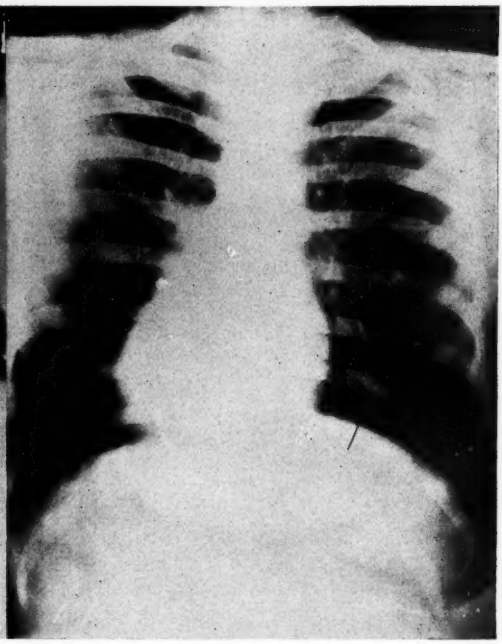

Fig. 11, Case 8. Solitary sharply circumscribed nodule lower right chest; pre-operative film, diagnosis—probable metastatic sarcoma.

almost eighteen months at the time the symptoms and X-ray signs commenced. Davis finds the average interval between the administration of treatments to the chest and the onset of clinical symptoms and X-ray findings, in the X-ray pleuritis case, to be only two to three weeks.

In addition to this, the densities have shown no tendency to partially resolve, which the X-ray pleuritis often does, but, rather, are growing persistently larger and more confluent, and, lastly, the general clinical picture is quite consistent with extensive metastases, since there is definite involvement of one rib, enlargement of regional glands, and the patient has shown some weight loss.

Therefore, our own opinion is strongly in favor of the pathology in the lower right chest being that of metastatic carcinoma, with the area possibly representing a *locus minoris resistentiæ* following infectious disease and X-ray radiation, but not a simple X-ray fibrosis.

GROUP III, CASES TREATED AND DEFINITELY BENEFITED

Case 6. Female, age 50, complaints—pain between shoulder blades, and in lower back. A radical breast amputation had been done in September, 1925. Despite the fact that the patient had suffered considerable back pain for several months, as well as slight pain at site of breast tumor, films interpreted the same day the patient was operated on showed metastatic destruction throughout the spine and pelvis, with marked narrowing of the body of the fourth dorsal vertebra (Fig. 9). When the patient was first referred for therapy shortly after the operation, her pain in the upper dorsal region was so severe as to make it completely impossible for her to lie face down, so the region was radiated through two portals obliquely from in front. Beginning shortly after the first treatment and continuing with further ones after her discharge from the hospital, the patient has become freer and

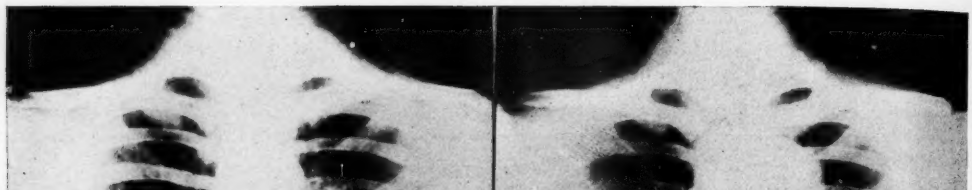

Fig. 12, Case 8. Three weeks post-operative. Rapid increase in size and number of metastases.

Fig. 13, Case 8. Six weeks after taking film shown in Figure 11. X-ray therapy to chest commenced this date. Additional nodule in superior mediastinum.

freer of symptoms. She now walks in for her treatments with no appreciable pain in the spine, nor any increase in size of the large nodule behind the heart, which has been present since her operation in September, 1925. She has long since discontinued the morphine she was taking for the pain in the back and is now doing without drugs, except for an occasional small dose of luminal when she sleeps poorly. Meyerding, Carman, and Garvin recently reported a large series of metastatic bone cases arising from primary carcinoma of the breast, in which they showed the average life-duration following the discovery of metastases to the bones to be only 4.7 months, yet Pfahler in 1919 demonstrated that occasional patients with extensive skeletal metastases might be relieved of terrific pain and kept comfortable for twenty to thirty months by radiation therapy through numerous portals.

Case 7. Male, age 45, complaint—tumor in left side of abdomen (no chest symptoms). A hypernephroma of the left kidney was surgically removed in May, 1920. He was well thereafter until March, 1924, since which time he has been under the constant care and observation of the treatment clinic. In March, 1924, patient noticed recurrence of mass, which was then considered inoperable. During the past twenty-three months there have been periods of very rapid increase in size of the mass, but throughout this entire period he has responded beautifully to X-ray treatment. Although it is true that at the present time he carries a tumor which seems to completely fill the left half of the abdomen, he is still in good general health and is able to work and earn his livelihood. He has had a solitary metastasis (Fig. 10) in the lower right lung for at least four months, which, as might be expected, is symptomless and which has already received radiation locally and showed no change in size, throughout that period of time.

While statistics on the life-duration of patients with primary hypernephroma, or of this tumor with definitely recognized me-

tastases, are very meager, Ewing states that hypernephromata possess considerable malignancy and general metastases are frequent.

Case 8. Female, age 18, complaint—lump in groin (no chest symptoms). For about a year the patient had noticed a mass in the right groin which was most pronounced after exercise and seemed at times to disappear upon rest in bed. Pre-operative chest film showed a single solitary nodule (Fig. 11) in the lower right lung field, which was interpreted as probable metastatic sarcoma; still the groin tumor was considered an operative one. Upon incision, an extra-peritoneal cystic mass, which could be removed only in part, was found. The pathological report was embryo-sarcoma, or a mixed tumor, the sarcomatous element made up of rapidly growing cells. As soon as the patient's post-operative condition warranted, she was given one sub-erythema dose of penetrating rays over the field operated upon. However, serial chest films taken at short intervals showed the tumor to be rapidly metastasizing throughout both chests (Fig. 12). Throughout the entire course, this patient never had symptoms referable to the chest condition, nor even demonstrable physical signs. Approximately six weeks post-operative, chest radiation was commenced (Fig. 13), with quarter-erythema short wave length rays through four large portals (two anterior and two posterior). Figure 14 shows the appearance in the midst of her treatments; Figure 15 the appearance after the administration of the tenth and final treatment; Figure 16, taken approximately three months after discontinuing treatment, shows the chest still entirely free of metastases. In addition to the first treatment, immediately post-operative, she had three additional sub-intensive treatments to the groin and now shows nothing definitely palpable except for some post-operative thickening of the tissue.

The origin of this tumor warrants much speculation; so far as inspection and palpation could determine or the operative findings show, all the pelvic organs were normal. Since the growth was definitely extra-peritoneal, it is possible that it arose from the canal of Nuck, an embryonic remnant in the female which corresponds to the ductus deferens in the male.

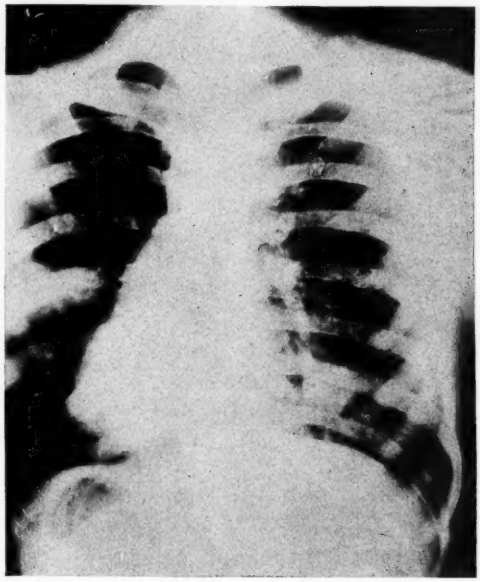

Fig. 14, Case 8. Showing condition during administration of treatments.

The easy response to therapy in this case is only indicative of its cellular activity and is confirmatory of the microscopic impression. The operative efforts affecting only a partial removal and metastases being widespread at the time treatment was commenced, it is, of course, not to be expected that more than a temporary remission has been accomplished. As Hirsch has stated, while benign tumors do not grow less sensitive to repeated radiation, recurrent malignant tumors are often less sensitive; hence we feel that we have accomplished palliation only, despite the initial complete responsiveness of the metastases to treatment.

CONCLUSIONS

1. As has already been noted repeatedly by other observers, so in our series, the majority of even well advanced pulmonary

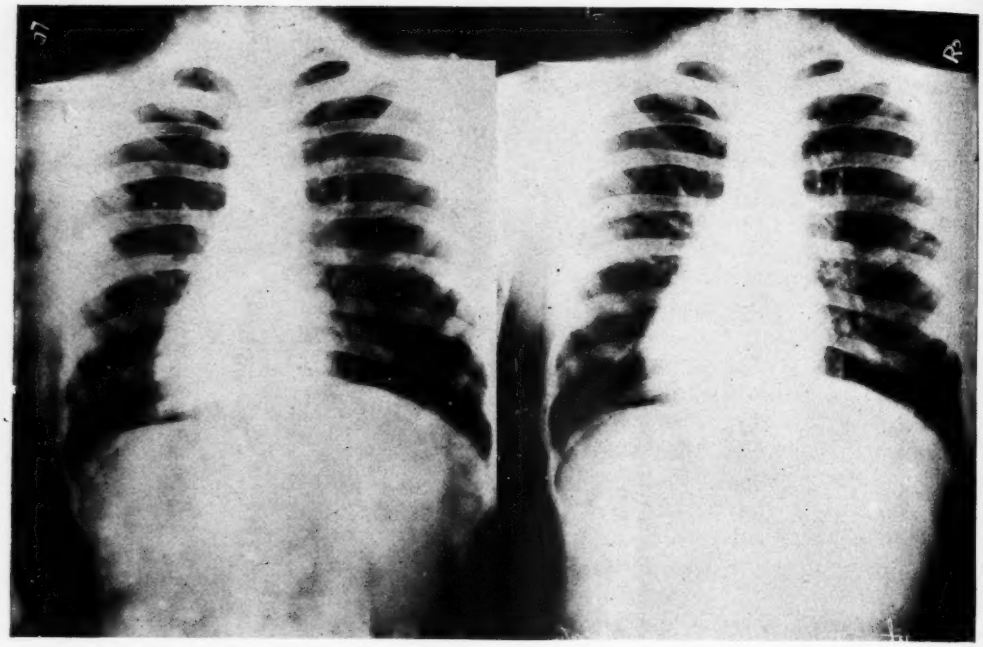

Fig. 15, Case 8. Showing condition on day of completion of ten chest treatments through four portals, each treatment ten minutes.

Fig. 16, Case 8. Showing condition approximately three months after discontinuance of treatment to chest; lung fields still clear.

metastatic cases will still be free of symptoms.

2. Still greater co-operation is needed between surgeon and radiologist, that unnecessary and even harmful operations be prevented where undoubted X-ray evidence of metastatic malignancy is established before operation.

3. All cases of metastatic malignancy in the chest are not suitable to radiation therapy, but when the indications are favorable, marked ameliorations of symptoms and temporary remission of the disease can usually be accomplished.

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THE NEWER CLINICAL ASPECTS OF GASTRIC CARCINOMA [1]

By GEORGE B. EUSTERMAN, M.D., Section on Medicine, Mayo Clinic, ROCHESTER, MINNESOTA

THE traditional conception of gastric carcinoma from the standpoint of diagnosis and prognosis is in need of revision in the light of modern medical progress. This can be said, even though the genesis of carcinoma itself still remains unexplained and there is no reliable specific test for its early detection. The pathologist, surgeon and roentgenologist in particular have added much to our knowledge of carcinoma in its various forms, and their contributions have been of aid in its earlier detection. To be more specific, the pathologist's conception of the evidence of the malignant transformation of a benign ulcer, and the roentgenologist's recognition and localization of circumscribed lesions, with an estimation of their probable size and extent, and the diagnostic significance of other clinical aspects that I shall discuss, have made possible earlier recognition of actual and potential malignant processes in the stomach.

As proof of progress two sets of statistics may be briefly compared, one compiled in 1914 by Friedenwald and another from material in the Mayo Clinic, seven years later. In a clinical study of 1,000 cases of cancer of the stomach Friedenwald noted that a palpable tumor was present in 72 per cent, anacidity in 89 per cent, occult blood in 92.5 per cent, and the Oppler-Boas bacillus in 79 per cent. In only 28 per cent of these was operation performed, and of these, a radical operation was performed in only 3.3 per cent. During the years from 1918 to 1920, inclusive, 1,408 patients with gastric carcinoma came under our observation. In 777 no operation was carried out. The majority of these were inoperable, from the standpoint of physical or roentgenographic examinations, or both. Of 631 patients who underwent operation, 80 had carcinomatous ulcers. Palpable masses were found in 51 per cent of these cases, gastric retention in 60 per cent, anacidity in only 55 per cent. A radical operation for resection of the tumor or lesion was performed in 46 per cent, some form of palliative operation in 16 per cent, and in the remainder, 38 per cent, exploration only was done. Of further interest was the fact that 45 per cent of carcinomatous ulcers were recorded as simple benign lesions, 41.25 per cent as malignant ulcers, and in 13.75 per cent the diagnosis was that of probable malignant ulcer. In other words, in more than 40 per cent of the cases of malignant ulcer the case history, clinical and roentgenologic findings were indistinguishable from those associated with chronic benign gastric ulcer. It is reasonable to infer that the malignant lesions in the second series were detected at an earlier and more operable stage in the aggregate.

Such improvement justifies more optimism than has prevailed in the past with regard to carcinoma of the stomach. However, in spite of gradual progress, particularly in roentgenologic methods of diagnosis, certain factors inherent to carcinoma of the internal organs, to which gastric cancer is no exception, make the problem of early recognition a formidable one; gastric carcinoma may give but few, if any, symptoms until it is well advanced, or the symptoms may be protean in nature. Moreover, the primary situation of the growth may be such as to make it irremovable, or the prognosis following removal may be bad, even if the diagnosis is made early. These features, and the fact that the patient may put off seeking medical attention, and even his medical advisor occasionally belittle the significance of the gastric disturbances, which usually have a more serious import after middle life, warrant in a large measure the pessimism manifested in some quarters even to-day in regard to the ultimate prognosis in cases of carcinoma. Less than

[1] Read before the Radiological Society of North America, at Cleveland, Ohio, December 7, 1925.

Fig. 1. Roentgenologic appearance that of tumor of the posterior wall of the stomach near antrum, probably benign.

Fig. 2. Roentgenologic appearance that of gastric ulcer rather high on lesser curvature.

half of such patients coming to the clinic are operated on, and in only 25 per cent is the growth confined to the stomach at the time of the operation. Statistics based on a larger, though earlier, series of 2,100 cases in which operation was performed, show that the lesion was removed in 35 per cent only, exploration carried out in 35 per cent, and some form of palliative operation performed in the remaining 30 per cent.

SYMPTOMS

The major complaints may range from asthenia or anemia to the pain, vomiting and cachexia of a perforating obstructing lesion. In 47 per cent of the proved cases of gastric carcinoma in the Mayo Clinic, the history was that of the accepted syndrome of benign ulcer. The familiar clinical picture of carcinoma with the characteristic findings on gastric analysis or physical examination, represents a frank or advanced stage. Occasionally a short duration of symptoms (the lesion being clinically early) may be associated with achlorhydria, blood in the gastric contents, gastric retention, palpable tumor or findings usually characteristic of the advanced lesion (Fig. 1). The symptoms are conditioned largely by the site and extent, and especially by the degree of motor impairment. Obviously a lesion at the pylorus will engender symptoms different from those produced by one at the cardia; a lesion in the body of the stomach may be silent until well advanced; when the lesion is malignant and more or less circumscribed, the presenting symptoms may be quite characteristic of benign ulcer and the clinical course an intermittent one, responding favorably to treatment at the outset. Exclusive of the non-obstructing small lesions, and of some of larger extent in a high-lying stomach, the majority of the cases of gastric carcinoma are readily diagnosable as such on the basis of history, physical examination and gastric analysis. In these the fluoroscopic and roentgenographic findings serve to confirm the diagnosis, determine the situation and extent of the lesion, and furnish criteria of operability so far as the stomach itself is concerned. Under any circumstances the experienced clinician seeks out and is cognizant of the significance of late onset, failure of adequate response to proper treatment, the steady progression, the resigned demeanor or depression, appearance suggestive of anemia, metastatic phe-

nomena, and loss of weight out of proportion to the symptoms, all of which should be considered as positive evidence of carcinoma until proved otherwise. He is also mindful of those constitutional diseases, chronic toxic or septic states, those chronic inflammatory lesions of the accessory digestive tract which directly or reflexly cause gastric disturbances, and systemic changes or even gastroenteric hemorrhage, all of which may be erroneously attributed to the presence of gastric carcinoma. Under such circumstances a negative roentgenologic examination of the stomach is, of course, of peculiar value, time-saving, and reassuring to the examiner.

MALIGNANT TRANSFORMATION OF A BENIGN ULCER

When a benign ulcer has become malignant, the alert clinician can frequently elicit a slight suspicious change in the nature of the symptoms, even before there is anything characteristic in the examination of the test-meal or roentgenologic findings, or even, indeed, before any signs of malignancy can be grossly seen in the ulcer. Such changes may be summarized as follows: (1) loss of periodicity of attacks; the attacks are longer and the intervals of relief shorter; (2) loss of periodicity of pain, the pain tending to persist after eating; (3) less severe pain, but a more constant dull ache, increased by eating; (4) loss of appetite, which may ensue even when the test-meal shows the high acidity characteristic of ulcer; (5) variation in the vomiting, which may diminish in amount and frequency although it is rarely increased unless there is obstruction; when this symptom is present it will no longer produce complete relief from pain; (6) diminution in gastric acidity compared with that of a recent test-meal, and (7) persistent occult blood in the feces when the diet is controlled in cases in which the neoplasm has progressed beyond the microscopic stage. Allowance must be made for the fact that such changes may be induced by the complications of ulcer, particularly hour-glass deformity, penetration or slow perforation into the pancreas or liver, and pyloric obstruction. Such changes are as a rule never so early or so marked in these complications. In the demonstrable absence of such complications malignant disease of the stomach should be strongly suspected. Roentgenologic indications of malignancy, such as the niche type of ulcer with an unusually large crater, and the roentgenoscopic demonstration of ulcerating carcinoma with a meniscus-like crater, constitute a significant advance. In the presence of such findings surgical interference should not be delayed, other things being equal (Fig. 2).

DIFFERENTIAL DIAGNOSIS

The cancer age is one when degenerative changes in vital organs are prone to occur which, among other causes mentioned, give rise to gastric disturbances and physical deterioration which may simulate those attributable to gastric carcinoma. A negative roentgenologic examination invariably makes one seek elsewhere for the cause of the symptoms. Where an intrinsic gastric lesion is demonstrable or highly probable, the internist and surgeon must decide whether it is benign or malignant, as the welfare of the patient is so vitally concerned. To differentiate chronic benign ulcer and its complications from a malignant one is our commonest problem. The uncertainty attending the task has already been mentioned.

Perhaps next in importance is the differentiation of gastric syphilis, because of its relative frequency. Fortunately, circumscribed syphilitic ulcers are rare, and quite indistinguishable roentgenologically from benign or malignant ones. I have reported one such case. Benign tumors represent 1.3 per cent of all gastric tumors that are seen at operation. As has been shown by Carman and Moore, both gastric syphilis

Fig. 3. Roentgenogram normal; apparently benign ulcer of the posterior wall shown roentgenoscopically.

Fig. 4. Roentgenologic appearance that of perforating ulcer of lesser curvature.

and benign tumors have certain roentgenologic characteristics by virtue of which their true nature can be often ascertained or surmised. So far as the clinician is concerned fibromatosis, sarcoma, lymphosarcoma, malignant papilloma and other like lesions are considered in the same light as carcinoma. Primary carcinoma of the duodenum, a series of which I have recently reported, and carcinoma of the pancreas, especially when not associated with jaundice, and when by extension it involves the stomach or obstructs the duodenum, may give rise to difficulty in differential diagnosis. On account of the rarity of such lesions we are occasionally caught off our guard, especially when the period of observation is a limited one.

Small or circumscribed gastric lesions that prove to be carcinomatous are of the greatest clinical interest because of their bearing on diagnosis, treatment and prognosis. Carman has reiterated the fact that in their gross characteristics and roentgenologic appearance these ulcers are not usually different from benign ones (Figs. 1, 2, 3, and 4). MacCarty has shown that ulcers with craters 2.5 cm. in diameter or larger are often malignant, and this is borne out by the roentgenologist. Yet in the last analysis one must be conservative, for small ulcers are often malignant on histologic examination and large ones may be benign. Other clinical evidence may throw no further light on the nature of the lesion.

CLINICAL AIDS IN DIFFERENTIAL DIAGNOSIS OF BENIGN AND CIRCUMSCRIBED MALIGNANT GASTRIC ULCERS

In the last five years 218 patients underwent gastric resection for removal of either a carcinomatous ulcer, or an ulcerating carcinoma of small size. Seventeen of these patients (8 per cent) were less than forty years, averaging thirty-five; fourteen were males. (In fact, 74 per cent of all patients with gastric carcinoma are males.) The average duration of symptoms in this group was three years. In only three cases was achlorhydria present. On the other hand, hyperacidity was present only in one, in which the lesion was of the subacute perforating type and the history characteristic of ulcer. Subacidity predominated in the remainder. The average size of the crater in this group was a little more than 3 cm. In order to determine in what way gross clinical factors may help distinguish be-

tween malignant and benign gastric ulcers a series of 576 cases of benign ulcer, in which operation was performed during the same period, were reviewed. With the average age of the patient with malignant neoplasm, of all types, is about fifty-four, a suspicion of malignant disease may be entertained between the ages of forty and forty-five, especially if the complaint is of recent onset. Somewhat to my surprise there were 129 patients aged forty or more, in the series of 576 cases, with a history of gastric disturbances of three years' duration, or less. The average age of these patients was fifty-three and the average duration of symptoms a year and a half.

A second group of cases numbering 116, in whom the symptoms had developed after the age of forty and had persisted for four years or longer, was then segregated from the series of cases of benign ulcer. The average age was fifty-five years and the average duration of symptoms a little more than eight years. The free hydrochloric acid titer in both groups was either normal or above in 90 per cent.

Observations on the absence of free hydrochloric acid in the series of cases of benign ulcer were instructive. Achlorhydria was present in only six in the first group of 129 cases in which there was a short history of dyspepsia, and in one of these cases death occurred later from gastric carcinoma, verified by ante-mortem examination. Almost without exception the ulcers were situated high on the stomach, had perforated, and were found in patients with marked oral sepsis. In the second group (116 cases) there were also only six which showed pathologic characteristics similar to those of the first group. Thus out of this total of 245 cases of benign gastric ulcer there were actually eleven only with achlorhydria (the case of carcinoma being necessarily excluded). These lesions were considered in all probability of infectious origin on account of the marked focal infection present and because of their perforative tendencies.

To summarize, 8 per cent of carcinomatous ulcers occur in patients less than forty years of age. With our present available methods of diagnosis it is usually impossible to distinguish them from benign ulcer (Fig. 3). Gastric ulcers in patients past middle age may be considered as benign in the presence of adequate acidity even though the symptoms may be of short duration, and gastric ulcers in elderly patients usually remain benign in spite of long duration of symptoms. An adequate acidity is a fair clinical criterion of their non-malignant nature. Only 4.5 per cent of chronic benign gastric ulcers in patients past middle life are associated with achlorhydria. They represent mainly the infectious perforating type. It is reasonable to infer, as experience has taught us, that roentgenologically depicted circumscribed lesions associated with subacidity or anacidity are potentially or actually malignant, with few exceptions (Fig. 4). If there are such additional features as a large crater, tumefaction, early onset of obstruction, onset late in life, an irregular or progressive history in the absence of demonstrable complications, or inability to obtain adequate or complete relief by proper treatment, then malignancy is highly probable, and surgical interference should be urged.

NECESSITY FOR CO-OPERATION OF INTERNIST AND RADIOLOGIST

For diagnostic accuracy it is necessary to marshal all available facts, correlate them logically and base a decision on the preponderance of the evidence. Roentgenography of the stomach in expert hands has reached an enviable state of efficiency so that it almost amounts to an exact science. But circumstances are constantly arising which make essential the use of all our diagnostic resources. The tendency of the profession to skimp the all-important anamnesis and physical examination, the frequent omission of gastric analysis and other simpler tests which, of course, all require time, patience and skill, is to be deplored. Such incomplete examinations, especially

when coupled with unskillful roentgenographic examination or faulty interpretation, are a prolific source of error in diagnosis and treatment. The real nature of the lesion, its complications and extensions, its effect on the physical and mental state, the mode of treatment or pre-operative preparation necessary, and the ultimate prognosis all depend on data derived from a systematic examination. To illustrate, a gastric neoplasm operable from a roentgenologic standpoint may be obviously inoperable after careful physical examination, owing to the detection of metastasis of one of various sites remote from the growth. Not infrequently patients in the cancer age, with an intrinsic gastric complaint of short duration, possibly associated with early signs of physical deterioration, give no evidence of a lesion on the screen or roentgenogram. Gastric analysis may also reveal the presence of achlorhydria, possibly of blood, and so forth. During hospital observation there is evidence of persistent blood in the feces and the anamnesis is confirmed and extended. Repeated roentgenologic examination of the stomach, gastroscopic examination or operation reveals an intrinsic lesion, usually high on the posterior wall. The roentgenologist, too, finds it difficult sometimes to judge the nature of small obstructing juxtapyloric lesions and their situation, whether gastric or duodenal. Other clinical data might furnish the clue with a fair degree of certainty, and thus profoundly influence treatment and prognosis. The inflammatory, instead of the neoplastic, nature of tumors, too, is demonstrable by the history of recent acute pain, fever, leukocytosis and sensitiveness. These and other circumstances show the necessity for co-operation, but even with combined effort and judgment we must leave the final answer, frequently enough, to the surgeon and pathologist.

CASE REPORTS

A man aged thirty-six years, complained chiefly of weakness during the previous four months (Fig. 1). Relatives and friends also noticed a decidedly anemic appearance during this time. He had not improved with rest, and milk and egg diet. Two weeks prior to his admission to the clinic he began to experience an epigastric burning sensation, usually at 3 A. M. only, which would awaken him. This distress was relieved by a drink of milk. The local physician found persistent occult blood in the feces.

Examination revealed a small movable mass in the epigastrium. Gastric analysis showed no free hydrochloric acid in the first fraction, but subsequent samples removed at fifteen-minute intervals revealed the presence of free hydrochloric acid in normal strength and quantity. The screen and roentgenogram outlined a tumor on the posterior wall of the stomach near the antrum. It was regarded as benign rather than malignant. At operation a carcinomatous ulcer 5 cm. in diameter was found. Partial gastrectomy was performed.

A man, aged twenty-six, had undergone gastro-enterostomy elsewhere in March, 1920, presumably for duodenal ulcer (Fig. 2). Within two weeks after operation he had a recurrence of symptoms which consisted mostly of eructations, vomiting, and pain, irregular in appearance. The pain was mostly dorsal in location. Examination in December, 1920, showed normal gastric acidity with a tendency toward hypersecretion. Fluoroscopic examination revealed no characteristic deformity, and the new stoma was patent. But operation (January 10, 1921) revealed a small ulcer (11 mm. in diameter), on the lesser curvature of the stomach. This was excised and the patient remained very well for eighteen months. At re-examination (October 10, 1924), there was a history of progressive and painful gastric complaint characteristic of a perforating and adherent or malignant ulcer. Gastric analysis by the fractional method showed complete absence of free hydrochloric acid and the presence of blood. The roentgenoscopic examination and films revealed the niche of a gastric

ulcer rather high on the lesser curvature. At operation (October 25, 1924) an ulcer (4 by 4 by 1 cm.) was found, with extension through to the serosa. It proved to be a Grade 3 carcinoma. The patient was alive and well in November, 1925.

A man, aged thirty-one, white, came under observation in January, 1921 (Fig. 3). His complaint was characteristic of chronic peptic ulcer of two years' duration. No ulcer was found either on fluoroscopic examination or at the surgical exploration. As both the appendix and gall bladder showed evidence of disease they were removed. He was re-examined January 14, 1922, because of recurrence of original symptoms after eight months' relief.

The total acidity was 52, free hydrochloric acid 32, and the filtrate 100 c.c. There was no blood.

Roentgenoscopic examination revealed an ulcer on the posterior wall of the stomach, not visible on the films.

At operation (February 10, 1922), transgastric excision of ulcer area with cautery, and posterior gastrojejunostomy were performed. The tissue from the ulcer showed carcinoma microscopically.

November 19, 1925, the patient reported recent gastric distress after meals.

A man, aged sixty-three, white, had gastric distress for thirteen months prior to examination (Fig. 4). This distress appeared from two to three hours after meals and was not relieved by liquids, food or alkalis. There was no nocturnal distress. The total acidity was 58, free hydrochloric 38, and the amount of the contents 65 c.c. Roentgenologic examination showed a perforating ulcer of the lesser curvature in the body of the stomach. At operation (July 11, 1923), a carcinomatous ulcer (5.5 cm. in diameter) was found on the posterior wall of the stomach. Partial gastrectomy was performed. The patient was alive and well in January, 1925.

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DISCUSSION

Dr. C. G. Sutherland (Rochester, Minn.): This little controversy as to whether gastric carcinoma can be superimposed on ulcer is a small consideration in the general consideration of the diagnosis of carcinoma of the stomach. Roentgenologically, we do not diagnose carcinomatous ulcers as such. They are a small group, and as we check them over from year to year we find them about equally diagnosed as gastric ulcer and gastric carcinoma. A small percentage of carcinomas, in a year, have been diagnosed as gastric ulcer, but the great majority of those diagnosed carcinoma roentgenologically prove to be carcinoma at operation. In the whole group of lesions of the stomach, we are most accurate in our diagnosis of carcinoma. Fluoroscopy is a large factor in this accuracy; the gastric carcinoma must be palpated; the patient must be turned to all angles to bring out the lesion; in quite a number of cases we see quite large lesions on the posterior wall that cannot be seen in any plates or series of plates.

Dr. Eusterman (closing): I am afraid that Dr. Crane misinterpreted my remarks relative to the etiologic relationship between ulcer and cancer. What I meant to convey was that in a certain number of cases of gastric cancer, about 42 per cent, our records show an antecedent history characteristic of ulcer. I did not mention the number of benign ulcers transformed into malignant ones. Among other things, my purpose was to show that in circumscribed le-

sions there are certain clinical aspects that help to differentiate a benign from a malignant ulcer, and that perhaps we have overemphasized the malignant potentialities of gastric ulcer in elderly patients. Against this fact the material, histologically verified, showed that 8 per cent of clinically benign ulcers in patients under forty years of age were malignant, that in 4.5 per cent of cases of benign gastric ulcer in patients past middle life a consistent achlorhydria was noted. Such lesions are undoubtedly of infectious origin, and have a tendency to perforate or bleed, comparable to lesions of similar origin in the duodenum. With this, and a few other minor exceptions, achlorhydria is one of the dependable clinical earmarks of cancer, especially when associated with blood or a large niche. One must remember, however, that in 46 per cent of our proved cases of gastric cancer there is free hydrochloric acid in the gastric content.

Relative to the prognosis, three- and five-year cures after radical resection for cancer are not uncommon, and, as Billroth has said, without operation the mortality is 100 per cent.

X-RAY DIAGNOSIS OF PULMONARY TUBERCULOSIS IN CHILDREN [1]

By JOHN D. MacRAE, M.D., Asheville, N. C.

ADULT lungs without pathological changes are practically unknown, but we have a definite idea as to how normal and diseased lungs should look in radiograms. These definite ideas have been formed by correlating the X-ray findings with knowledge of anatomy and pathology, physical examinations, clinical manifestations and history. We can diagnose pulmonary tuberculosis in adults with a fair degree of accuracy because we know that the disease attacks certain tissues and produces changes in them which are characteristically depicted in X-ray films, and we have learned to evaluate these signs by constantly conferring with clinicians, and comparing our signs with postmortem findings.

It is agreed that pulmonary tuberculosis rarely ever occurs primarily in adults. If this be true, and I believe it is, incipient tuberculosis is a disease of infancy and childhood. The cure of tuberculosis and reduction of its incidence depend on its early recognition, and since tuberculosis produces a maximum of disability and death it is plain that our greatest responsibility as physicians lies in diagnosing the disease in infancy and childhood. The responsibility is chiefly with the radiologist and pediatrician.

A pediatrician suspects tuberculosis in a child when the child fails to gain in weight and is easily fatigued, showing disinclination to play. A history of exposure to the disease prompts him to apply various tests and to make a physical examination. It is now that the radiologist is called upon for assistance and co-operation. The usefulness of the radiologist and his knowledge of infantile tuberculosis will progress as the disease does, if given a chance, for his knowledge is not much beyond the incipient stage.

The signs elicited from physical examination and the X-ray appearance of chests of normal children was described by the Committee of the National Tuberculosis Association in the *American Review of Tuberculosis*, July, 1922. This Committee, composed of three eminent internists and three equally eminent radiologists, agreed that the normal chest was ideal and that there is a wide variation within permissible limits. They also agreed that no part of a complete examination should be accepted to the exception of any other part; that by the time a child is six years old (the Committee dealt with over five hundred children from six to ten years of age), there are inevitably evidences of pathological processes in the lungs of healthy children.

The radiologists of this Committee presented a diagrammatic radiograph of the ideal chest of a healthy child between six and ten years of age. It shows the lungs as divided into inner, middle and outer zones on each side of the mediastinum. The hilum shadows lie in the inner zone, trunk shadows in the middle, and the outer zone has in it the shadows of the terminal branches of the trunks, represented by linear markings which fade out at the periphery. This work was specifically to determine what are the characteristics of the chest of a healthy child between six and ten years of age. The radiologists who undertook it laid stress on the fact that hypertrophy of hilum lymph nodes presents the same appearance whether it follows infections, such as measles and whooping cough, or is the result of tuberculous infection.

Dr. Wasson has started and is continuing a most useful work on the "progression of the chest." First, he developed a technic which produces lung radiographs rich in detail, depicting the minute structures very clearly. He has followed that up with serial X-rays of infants' lungs, beginning at

[1] Read by title at Annual Meeting of the Radiological Society of North America, at Cleveland, December, 1925.

birth and continuing at intervals of a few weeks, to be carried on until the child is grown. This work has, up to the present time, dealt with children under the age of those studied by the Committee of the National Tuberculosis Association. Dr. Wasson shows that in the newborn the structures casting shadows are the blood-filled vessels, bronchi and the connective tissue binding them together. These tissues are in greatest abundance at the hila and are responsible for the density of the trunks and their terminal branches, as seen in the inner, middle and outer zones of the lungs. He emphasizes the fact that lymph nodes are not visible to the naked eye at the hila in newborn, and are not thus recognizable until the child has reached its fourth year, unless they result from a pathological process. His work is destined to be of tremendous value and it is to be hoped that many such studies may be carried on in the interest of better knowledge.

Pathologists tell us that tuberculosis is a disease of infancy and childhood, that it is a disease of lymphoid tissue, and that it is commonly contracted by inhalation or ingestion of tubercle bacilli. By either route the infection may quickly reach the lung. The primary focus in the lung is probably not recognized. Existing in the parenchyma, where a few bacilli are deposited, it probably causes a small and transient amount of infiltration which may be visible in excellent films if made at the critical moment. In the natural sequence of events the bacilli are taken up by the lymphatics and affect the lymph nodes at the root of the lung, producing hypertrophy, and this is the thing which is first recognized in X-ray films. Lymphadenopathy from tubercular or other infections presents the same appearance, so that the diagnosis is dependent on a study of history and symptoms as well as on the X-rays. The symptoms may be out of proportion to the extent of glandular involvement.

Glandular hypertrophy may be followed by resolution, but oftener caseation and fibrosis or calcification take place. Repeated X-ray examinations show the glands to be disappearing or becoming smaller and more dense. On the other hand, caseation is followed by liquefaction and the infected material may be widely disseminated in the blood current and produce miliary tuberculosis, or the necrotic gland may rupture into a bronchus and be aspirated into the lung, where areas of caseous pneumonia will develop.

An hypertrophied lymph node obstructing the return of blood and the flow of lymph to the hilum causes a retrograde lymphangitis to develop in a trunk which eventually recedes, leaving a nodule where arrest or healing took place. It is some modification of these processes which produces the hilum type of tuberculosis, or the basal type, which are occasionally seen in children. The adult type of tuberculosis in children occurs when the patient has developed some degree of relative immunity, established by repeated mild infections with the tubercle bacillus, and this condition has been characterized by fibrous tissue deposits at the site of infection.

What I wish to urge in this paper is that we show to pediatricians and internists that X-rays will demonstrate all but the most minute tuberculous lesions in the lungs of their little patients and that we are ready —and wish—to co-operate with them. Our success in this important work depends on perfecting technic and studying a large number of cases with the men who have examined them clinically and physically.

The study of the infant chest with X-rays has just begun and is of tremendous importance.

RADIO-ACTIVE SUBSTANCES AND THEIR THERAPEUTIC USES AND APPLICATIONS

RADIUM TREATMENT OF RECTAL CARCINOMA

(Continued)

By JOSEPH MUIR, M.D., New York City

THE difficulties which confront the radium therapist who is called upon to treat rectal carcinoma have been shown by what has been said in the preceding paragraphs to be peculiarly numerous and vexatious, so it is hardly strange that the pessimism which has for so long a time marked the mental attitude of proctologists generally toward this particular lesion, should be shared by those who are enthusiastic concerning the use of radium in the treatment of other malignancies.

This position is very well illustrated by the remarks of Coffey, one of the best known of American rectal surgeons, when he says: "The remarkable success of radium in treatment of cancer of the uterus has led us to hope that the same might be true of cancer of the rectum. We have been greatly disappointed. A satisfactory reason for our failure to get good results in cancer of the rectum has not been given. Hochenegg's clinic reports more than seven hundred cancers of the rectum treated. Of these, twenty-eight were treated by radium and only one gave good results. Many were made very uncomfortable and were worse than if no treatment had been given. Some other clinics have had equally disappointing results."

During the same week that Coffey read his paper before the American Medical Association, Curtis C. Mechling, of Pittsburgh, presented to the American Proctologic Society the report of a case of rectal cancer "cured with radium and operation." The patient had remained without recurrence for two years, and the "cure" was attributed to "accurate application of the element." Yet in the discussion which followed the presentation of this case it is somewhat surprising to find the author stating he did not believe that radium was particularly useful in treating cancer of the rectum, that he had used it in the case under consideration out of necessity, and had reported it to the Society hoping to bring out a discussion and "to call attention to the fact that the reputation of radium has come from the surgical specialists"—the gynecologists in particular—"who know how to use it. If we are to get anything out of the use of radium in cancer of the rectum, it must come from the proctologists, not the radiologists." A study of Mechling's case report shows that the patient was left with a stricture which caused her so much pain that it was necessary to resect it, and that after receiving a total of 4,850 mg. hours the scar tumor showed an anal stricture low down, another two and one-half inches higher up, and an unhealed ulcer between. In the intervals between three applications she had suffered irritation and burning in both rectum and vagina. It is easy to believe that the patient's opinion as to the desirability of radium treatment, attended with such unpleasant manifestations, pretty well coincided with that of her attendant.

These adverse criticisms of radium therapy of rectal cancer were made four years ago, and, as I hope to demonstrate later on, factors have since come into existence which have greatly altered the entire situation as regards radium therapy, yet even last year we find no less an authority and advocate of radium than A. E. Hayward Pinch, head of the Radium Institute of London, saying that when the performance of the major abdomino-perineal operation appears in any way practicable, it should be most strongly urged, "as the results to be obtained in this fashion far exceed anything that can be expected of radium therapy."

Perhaps a better understanding of the origin and persistence of this strong prejudice against radiation of rectal cancer can be reached if we consider, in some detail, the methods by which it has heretofore been applied, and the reasons which those therapists who have used it have brought forward to account for their non-success.

Referring again to Coffey, we find that a preliminary colostomy was performed in all cases, after which the radium was immediately drawn into the growth. In some cases a rectal tube of rubber was passed down through the colostomy opening and out through the rectum, in which the radium tubes were arranged tandem fashion. An annular pack of gauze was sewed around the tube so as to partially cover the lower radium tube, the purpose of this pack being to halt the tube exactly at the growth as it was being drawn upward. In cases where the growth was strictly limited to one wall of the rectum, a sheet of lead was placed on the opposite wall for its protection. There is no other mention of filtration of any sort.

About the time that Coffey was writing, we find J. Rawson Pennington putting forward a method for anchoring radium in the rectum, which he advocates as an improvement of the method then in vogue. "The usual method," he tells us, "is on a flexible probe, especially if the growth is located in the sigmoid or upper rectum." This method he pronounces unsatisfactory because there is no means of knowing whether the radium is well within the mass or simply impinging against it, and even if the operator does succeed in locating the radium well within the growth and then fixing the flexible probe to the body, "he has no assurance that it will remain where the destructive action is to be exerted; the peristaltic wave and sphincter contractions may change these relations. Should he pass it down from a colostomy opening, the same objections obtain." By devising a contrivance which enabled him to measure the upper and lower limits of the malignant growth, Pennington was able to place the radium applicator more exactly and maintain it in that position, which was certainly a great advance over the previous methods, but the very necessity of such an innovation no longer ago than four years, shows how rapidly the whole science of radium application has advanced.

There is really very little in the literature concerning the application of radium to the rectum, so that it is with some difficulty that we can gather the evidence necessary to show just why this form of therapy has generally proved so unsatisfactory. One of the most extensive considerations of the subject is that of Kelly and Ward, describing the work done in the Kelly Hospital at Baltimore. These authors are distinctly optimistic in regard to the suitability of radium as a curative agent in malignancy in the rectal tract, for they conclude by stating that in radium alone, or with some operative procedure, we have, *par excellence,* our most valuable therapeutic agent in the treatment of cancer of the rectum in all stages. "Its therapeutic value lies both in its palliation and its high percentage of cures—11 per cent of those treated. As a palliative measure it benefited 62 per cent of all cases. In the hopeless group, radium is valuable in giving relief to various symptoms and affording comfort for the remainder of life."

An account of the treatment of two hundred cases of rectal cancer is given, with careful description of the technic employed and with end-results as far as possible, the "follow-up history" in some patients extending over a period of nearly ten years. "Only 6 per cent were considered as at all operable; the rest were inoperable, and as a rule applied for radium as a last resort. Out of this conglomerate group, 11 per cent were cured, 62 per cent benefited to a lesser or greater degree, and 27 per cent were left unbenefited." Of those patients who had operation as well as radiation, 17.5 per cent remained well at the time of writing, while in 50.5 per cent there was distinct improvement, more than half of these patients surviving for eighteen months or longer. It is

stated that though the radium-colostomy group did not give such good results as to well patients, it did give the highest percentage of palliation (68.7 per cent), with the lowest percentage of non-improvement (25 per cent).

Three different modes of application were employed: (1) Implantation of bare emanation needle points into the disease; (2) direct application of the emanation to the diseased area; (3) external or so-called deep radiation, with massive doses at a distance and fired into the diseased area from several directions. When the first method was used, the patient was put in the knee-chest posture and bare tubes of radium emanation implanted with a needle through a Kelly proctoscope. The strength of the tubes varied from 0.5 to 1.5 millicurie of emanation, and the "number of needle points thus inserted in an individual case naturally depends upon the size and get-at-ability of the growth. The rule is that one millicurie of emanation will destroy one cubic centimeter of tumor tissue. While this method affords the most direct and intensive application and consequently the most efficient and economical dosage, it is most effective in the lower, more accessible parts." For application directly to the rectal surface of the growth various devices were contrived, mostly gauze pads with pockets for holding the radium tubes, the filtration being accomplished by small oval pieces of lead wrapped with gauze. For an annular growth a hard rubber, finger-like applicator with a brass handle was employed, the rubber being from two to four millimeters thick. This applicator was hollow and cylindrical in shape, large enough to hold three or four tubes if necessary—the usual dosage being one or two grams. Lead cylinders with two or three inch portals served for heavy external application, usually being applied at three or four points over the sacrum and coccyx, at one point on the perineum, and upon the groins and suprapubic region. "If four areas are elected and the distance from the skin fixed at 3 inches, with a dosage of 10 gram hours over each area, we thus give a total of 40 gram hours, a substantial and effective dosage. This form of treatment, with the internal radiations and implantations, makes it possible greatly to reduce large tumors of the rectum and to relieve for years as well as cure a definite percentage of cases." It is claimed that this method produces some rectal irritation but no serious reaction, the bladder is seldom affected, and post-radiative scarring and stricturing occur only occasionally.

The patient treated by Mechling, whom he reported in 1922, had 50 mg. of unscreened radium placed in the canal at the anorectal juncture, and 25 mg. in the vagina, screened with lead on the urethral side. The element was kept in accurate position by being wrapped in and packed about with gauze. The exposure was for ten hours, given three weeks after the performance of colostomy. After a week's interval a second exposure of twelve hours was made, and six weeks later another of thirty hours. After a rest of five months a twenty-hour exposure was made, so that for something like eight months following the colostomy operation, the patient was in the process of "taking radium treatment."

During the four years from 1918 to 1921, inclusive, 161 cases of rectal cancer were treated by some form of radiation at the Memorial Hospital (New York). When Quick made his report upon them at the close of 1921, 14 patients had been clinically free from disease for from four months to four years, but, as elsewhere, most of the subjects coming in for treatment were in an advanced stage of the disease; "about 40 per cent of the group represent eleventh-hour efforts to try a new remedy," and the author felt, on regarding the situation retrospectively, that many of them "would have been better off had no treatment with radium been given." His experience in the technic of application "has been one of gradual change from applying filtered radium internally only, to a combination of buried emanation, filtered radium

internally and externally, and, if necessary, surgical exposure in order to make the application as accurately as possible." The original plan was to employ a single tube filtered with one millimeter of platinum and covered with rubber, which was inserted into the stricture, if one existed, or was held in approximation to the malignant area by gauze packing, when the lesion occupied only a portion of the circumference of the canal. Later, tubes of the same filtration but arranged tandem fashion and held at a distance from the mucosa by placing the small rubber tube which enclosed them in a larger rectal tube, were found less liable to injure the healthy rectal tissue. In 1917 the use of radium emanation was begun at the Memorial Hospital, and in work upon the rectum this form of the element was found to offer especial advantages in ease of application. "It permits of distributing the radiation throughout the growth, so that an accurate approximation can be made. It permits of using both the beta and gamma radiations, thus resulting in a saving of radium energy. It can be introduced into the upper portion of a growth through an abdominal incision and left *in situ*. It permits of continuous radiation over a period of a few weeks, thus resulting in greater dosage being possible than where filtered tubes or needles containing radium element are inserted for a few hours and then withdrawn."

The usual dosage at the time Quick was writing was one millicurie per tube, though it was regarded as safe to use up to two millicuries in each radio-active center. Depending upon the size and distribution of the growth, the dosage of buried emanation varied from 10 to 40 mc., making a total of 1,320 to 5,280 mc. hours, reckoning that each tube was capable of giving a radiation of 132 mc. hours. In addition to burying the emanation tubes directly in the growth, filtered radium is internally applied. In annular growths the former arrangement of platinum-filtered, rubber-encased tubes inserted the length of the canal, is used, 500 mc. hours per tube being the customary dosage. For a circumscribed lesion of the wall, solid rubber rectal bougies with the required number of platinum tubes lying in grooves at the sides, have proved more satisfactory. "Knowing the axis of the growth and its distance from the sphincter, it is possible to insert this applicator so that the tubes come in accurate and close approximation to the growth. If necessary, it may be rotated in order to complete the application. This applicator has the advantage of protecting, by distance, the opposite uninvolved rectal mucosa from the full dose of radium used over the growth." It is believed that surface radiation used in this way in conjunction with buried emanation inhibits the growth and produces a temporary retrograde process "during the course of which it is safer to introduce needles carrying emanation tubes," thus lessening any danger from trauma. In female patients, 2 mm. lead or brass plaques are used, one placed in the vagina, and from one to three being placed over the posterior wall, separated from it by about one centimeter of packing. Something less than 800 millicurie hours per plaque can be safely given in this way, in addition to that placed directly in the rectal canal. It is deemed necessary "to attack rectal cancer from every available angle" and to this end they have resorted to heavily filtered doses of radium held at a distance over the sacrum, or, in higher growths, over the left lower abdominal quadrant also. The "pack" used for this purpose is filtered by 2 mm. of brass and held 10 cm. from the skin, and is considered capable of the safe administration of 20,000 millicurie hours of radiation.

When we begin a search of foreign literature concerning the radium therapy of rectal cancer it seems that, though European radiologists, especially the French, are fully alive to the dangers and difficulties which attend the use of this element in the rectum, they are, nevertheless, distinctly more optimistic in regard to the real usefulness of

radium as a curative agent in this particular location. Thus Proust, head of the Hospital Tenon, where some of the most advanced work with radium has been undertaken, apparently feels that in view of the meager results which have in the past attended surgery for the extirpation of rectal malignancy, radium therapy offers the patient a distinctly better chance, and he also favors the combination of surgery—that is, colostomy—with the subsequent placing of radium tubes through the avenue thus opened. When colostomy is done solely for this purpose, he prefers an iliac anus, with complete section of the intestine. The rectum is dilated under regional anesthesia, and great pains taken to learn the exact dimensions and location of the malignant lesion. The applicator is carefully adjusted to the measurements thus obtained. Sometimes the source of radio-activity is a string of tubes filtered with aluminum and 2 millimeters of platinum, these being surrounded with a thick rubber covering. Again—presumably in annular lesions—a "chaplet" of tubes is arranged upon a rubber ring. Whichever apparatus is used, a string is attached to either end, one being passed out of the natural anus, and the other through the surgical opening, so that the applicator is adjustable from either end. The usual dose is from 30 to 40 mg. of radium element, left in position for about 100 hours. For anal cancer a longer application has been found to be necessary—five to six days for a dose of about 20 milligrams.

For the control of perirectal extension Proust suggests—although there is no mention of his ever having used it—a system of attacking the neoplasm "by the natural zones of perirectal separation." An incision being made into the retrorectal space, a series of small tubes could be disposed fan-wise, in such a way as to give an extremely homogeneous radiation. The danger here would be not so much injury to the rectal mucosa, as a possible effect upon the neighboring osseous structures, for bone is far more radio-sensitive than mucous tissues. Proust also advocates the use of X-ray in connection with radium radiation. Because of the existence of a zone of possible glandular infection beyond the malignant area which the combined methods of radiotherapy are able to reach, he believes that there should be a second application of deep radiotherapy some time after the first applications are made. Above all, he insists upon the importance of proper filtration; at least two millimeters of platinum and even more if the lumen of the rectum is not so reduced as to forbid it; with a second filtration of 3/10 millimeter of aluminum, or, better, a half-millimeter.

It is significant that under the system employed in France the general results have been such as to warrant a man of Proust's wide experience, stating that though he prefers surgery in very early cases where there is practical certainty of restoring the continuity of the canal and permitting control of the sphincter, in most of the cases which are well advanced before seeking medical aid, he regards radiotherapy as vastly preferable.

(*To be concluded*)

READY REFERENCE TABLES FOR SUPERFICIAL ROENTGEN THERAPY[1]

By H. N. BEETS, M.S., and ROBERT A. ARENS, M.D., Physicist and Roentgenologist, respectively, at the Michael Reese Hospital, CHICAGO, ILLINOIS

THE authors have long felt the necessity for simple convenient reference tables for superficial roentgen therapy. Such tables are herewith presented. The material for them has been abstracted from the standard literature on the subject. The skin unit (unfiltered X-rays) of Witherbee and Remer was chosen as the basis of the tables, because convenient and already in wide use. Table A gives, without computation, the time required to give a skin unit of unfiltered or filtered radiation. Table B lists alphabetically many of the conditions for which superficial therapy can be used and indicates the dosage of preference.

A constant treatment distance of 15 inches was chosen, rather than a shorter distance, for several reasons: First, patients do not like to be close to the tube; second (a reason of greater importance), the increased distance permits of greater latitude in treatment time. When the distance is so small that it becomes necessary to time the treatment with a stop watch, variations in voltage, milliamperage, or a moment's inattention may be costly.

Table A shows an arbitrary standard treatment time of 5 minutes for one skin unit for unfiltered radiation. If an aluminum filter is used, the time required to deliver the same amount of X-ray energy will be greater. The values shown in Table A for filters up to 2 mm. Al. have been checked by ionization measurements and are given to the nearest quarter-minute.

The gap and filter to be used in any given treatment are matters of judgment on the part of the radiologist. This judgment will be influenced by the capacity of his apparatus, by the clinical appearance of the lesion, and by his experience in the treatment of that particular type of lesion. Once the radiologist has decided on the gap and filter, Table A will show the milliamperage and time required to give one skin unit. Should Table B call for a fraction or multiple of the skin unit on any particular lesion, a simple mental division or multiplication will give the time required for the treatment.

The dosage shown in Table B, as being the treatment of preference, is not arbitrary. The values have been taken largely from Witherbee and Remer's admirable little book, "X-ray Dosage in Treatment and Radiography," from reports by other workers as found in the various journals, and from our own experience. When confronted with a lesion not mentioned in Table B, not more than one skin unit should be applied until further information can be obtained. Filters greater than 2 mm. Al. have not been considered, as this begins to border on what is known as moderately deep therapy.

Examples: *Keloid*, 5-inch gap, unfiltered radiation. Reference to Table A shows that a 5-inch gap and the 15-inch distance requires 5 milliamperes for 5 minutes to give one skin unit; Table B shows 1 skin unit per month to be the preferred dosage, therefore treat for 5 minutes. *Carbuncle*, 6-inch gap and 1 mm. Al. Table A shows that a 6-inch gap with 1 mm. Al. at the 15-inch distance requires 4 milliamperes and 9¾ minutes to give a skin unit; reference to Table B shows the preferred dosage to be 1½ skin units, therefore treat for 15 minutes. *Lichen planus*, 4-inch gap, no filter. Table A shows that a 4-inch gap and no filter requires 6 milliamperes and 5 minutes to give a skin unit at the 15-inch distance; Table B shows one-quarter skin unit weekly to be the dosage of preference, therefore treat for 1¼ minutes.

[1] Received for publication January 13, 1926.

DOSAGE TABLES FOR SUPERFICIAL ROENTGEN THERAPY

TABLE A

To give *one* skin unit, constant factor: Skin Target Distance 15 inches

Gap	ma.	Unfiltered	½ mm. Al.	1 mm. Al.	1½ mm. Al.	2 mm. Al.
3 in.	8	5 minutes	8.5	12		
4 "	6	5 "	8.25	11.5		
5 "	5	5 "	8	10.75	13.75	
6 "	4	5 "	7.5	9.75	12	14.5
7 "	3.5	5 "	7	9	11	13.25
8 "	3	5 "	7	9	10.75	12.5

One skin unit is defined by Witherbee and Remer as the dose required for the treatment of ringworm of the scalp, the hair falling out but returning in several months.

TABLE B

Disease	Dosage
Acne	¼ S.U. weekly
Actinomycosis	1½ S.U. monthly
Blastomycosis	1½ S.U. monthly
Bromidrosis	¼ S.U. weekly
Carbuncle	1½ S.U.
Comedones	¼ S.U. weekly
Epithelioma	1½ to 2½ S.U. monthly
Erythema induratum	1¼ S.U. monthly
Furuncle	1½ S.U.
Granuloma annulare	1¼ S.U.
Granulomata	1¼ S.U.
Hyperidrosis	¼ S.U. weekly
Keloid	1 S.U. monthly
Lichen planus	¼ S.U. weekly
Lichen scrofuloserum	1¼ S.U. monthly
Lichen simplex chronicus	1¼ S.U. monthly
Lupus	1¼ S.U. monthly
Mycosis fungoides	¾ S.U.
Neurodermitis	¼ S.U. weekly, 6 to 10 treatments
Onychia	½ S.U. bi-weekly
Paronychia	½ S.U. bi-weekly
Plantar warts	1 S.U.
Pruritus	½ S.U. first week, then ¼ S.U. for 6 treatments
Psoriasis	¼ S.U. weekly
Sarcoids	1¼ S.U.
Ringworm	1 S.U.
Scrofuloderma	1¼ S.U. monthly
Sporotrichosis	1½ S.U. monthly
Sycosis vulgaris	½ S.U. weekly
Tinea capitis	1 S.U.
Tinea feet or nails	1 S.U.
Verruca vulgaris	1½ S.U.

ONE HUNDRED MILLIAMPERE, THREE-TENTHS OF A SECOND TECHNIC

By E. C. JERMAN, Chicago

Part	Position	Kilovolts Peak	Pre-reading Voltage	Milli-amperes	Distance	Time	Tube
Gall Bladder	P.A.	76		100	22 in.	3/10	5–100
Stomach	P.A.	84		100	25 in.	3/10	5–100
Colon	P.A.	84		100	25 in.	3/10	5–100
Cervical	P.A.	92		100	6 ft.	3/10	5–100

The above chart is based upon an average adult (150 pounds). A medium focus universal tube may be used for the above exposures if the 5–100 tube is not available.

To change radiographic density, vary autotransformer (P.R.V.).

GALL-BLADDER TECHNIC

The gall bladder is commonly considered one of the most difficult organs of the body to radiograph successfully, due to the relatively slight difference in density between it and surrounding areas. Gallstones are generally considered as radiographing less successfully than calculi, or kidney stones, because of their composition, since they usually contain a much lower percentage of calcium or mineral salts, thereby being less opaque to X-ray light. Due to this lack of density it is very difficult to show clean-cut, sharp outlines of the gall bladder and gallstones. Since the introduction of the dye method, visualization of the gall bladder has become, of course, much less difficult, but the shadows cast by this method are oftentimes rather faint and more or less indistinct, so that technical procedure still has a very important part to play in either increasing or decreasing the diagnostic value of the resulting radiograph. Therefore, the same technical procedure is recommended in both instances.

Equipment. — Double screens are used for the purpose of obtaining more contrast with shorter exposure time.

A small diameter cone is used for the purpose of preventing secondary or stray radiation, in so far as possible, from reaching the film. This secondary radiation produces what is ordinarily called "secondary fog." Limiting the area of tissue exposed to the primary radiation by means of a cone, lessens the amount of secondary radiation delivered to the film.

An accurate time switch is necessary in order that exposures may be continuously duplicated.

A Bucky Diaphragm is not used because of the difficulty of making fractional second exposures with it.

A 5–100 radiator tube is recommended, or a medium focus universal tube may be used, because the large amount of energy required is too great for the smaller focal spots.

A stabilizer should be used in order that the milliamperage factor may be successfully duplicated.

Technic.—A distance of approximately twenty-two inches is used for the purpose of reducing the amount of energy required to the minimum. The time of exposure is fixed at three-tenths of a second, except for very large individuals, in which case the time of exposure is increased to five-tenths of a second. The short time of exposure is

necessary in order that movement may be obviated during time of exposure. Movement of the gall bladder may be caused by respiration, peristalsis, or heart action. Even slight movement of the gall bladder during time of exposure is most likely to cause faint contour lines to completely disappear. Shorter time than three-tenths of a second results in less contrast, due to the necessary increase in voltage which would be required. One hundred milliamperes is used so that the shorter exposure time may be used at a lower voltage. If too low milliamperage were to be used with the short time of exposure, a higher voltage would be required, which would result in less contrast. Too little contrast would result in a lack of differentiation in the structures involved.

With the above factors fixed, the radiographic density is controlled by varying the voltage (K.V.P.) with the autotransformer, the K.V.P. varying from 70 K.V.P. to 87 K.V.P., depending upon the thickness and density of the region exposed.

Position of Patient, Tube and Cassette.— The position of the patient is prone with arms extended over the head, and both arms and legs curved to the left to separate as much as possible the kidney, liver, and gall-bladder shadows.

In order that the position may be readily and easily duplicated, either on the same individual or various individuals, the points over which the tube is to be centered are marked with a skin pencil on the patient's back. A line is made, first, from the center of the spine outwards and even with the tip of the crest of the ilium; a second line, from the center of the spine outwards at a point which is opposite the ninth rib anteriorly; a third line, from the center of the spine outwards at a point directly half way between the first two lines, and a fourth line, lengthwise up the center of the spine from the first line described to the second one mentioned above.

The Coolidge filament light is used to aid in centering.

Four 8 × 10 radiographs are usually made: One, centered so that the lower margin of the filament light touches the line at the crest of the ilium, and the margin of the circle of light towards the spine is even with the line drawn up the spine; two, with the circle of light centered lengthwise over the center line, and the back margin even with the line on the spine. The reason that two radiographs are made in this position is that it has been found the majority of gall bladders are shown in this area. One is made with the upper margin of the filament light even with the line which is opposite the ninth rib anteriorly and the inside margin of the light the same as mentioned above.

STOMACH AND COLON TECHNIC

The object in radiographing the stomach and colon is to show the size, shape and position of the various barium-filled areas with clean-cut, sharp contour lines, as well as the position of these various areas as related to other anatomical parts.

Equipment. — Double screens are used for the purpose of obtaining more contrast with shorter exposure time.

The smallest cone possible to cover the area desired should be used; ordinarily a five- or seven-inch diameter cone is used. The object of the cone is to prevent as much as possible of the secondary radiation from reaching the film.

An accurate time switch is necessary in order that exposures may be continuously duplicated.

A Bucky Diaphragm is not used because of the difficulty in making fractional second exposures with it.

The 5–100 tube is recommended or a medium focus universal tube may be used, because the large amount of energy required is too great for the smaller focal spots.

The stabilizer should be used in order that the milliamperage factor may be successfully duplicated.

Technic.—One of the most difficult parts of the technical procedure is to obviate

movement due to peristalsis. This necessitates short-time exposures. With some individuals peristaltic action is more rapid than with others, or certain pathological conditions may cause more rapid peristaltic action. It has been found that with an exposure of three-tenths of a second, movement due to peristaltic action seldom interferes.

A distance of approximately 25 inches is used for the purpose of reducing to the minimum the amount of energy required. One hundred milliamperes is used so that the shorter exposure time may be used at a lower voltage, thereby increasing the contrast. With the above factors fixed, the radiographic density is controlled by varying the voltage (K.V.P.) with the autotransformer, the K.V.P. varying from 78 K.V.P. to 95 K.V.P., depending upon the thickness and density of the region exposed.

Position of Patient, Tube and Cassette. —The patient may be placed in either the standing or prone position. It may be found during the fluoroscopic examination that the most desirable view is obtained by slightly rotating him. The radiographic examination usually follows the fluoroscopic examination, during which time the area desired is marked on the skin of the patient. This enables the proper placing of the area desired in relation to the tube and film. The Coolidge filament light may be used to aid in centering.

LATERAL CERVICAL SPINE TECHNIC

A true lateral cervical spine, showing all seven cervicals, is considered more or less difficult, due to the fact that all seven cervicals in this position cannot ordinarily be placed in close proximity to the film. This technic is most valuable when it is more convenient to place the patient in the sitting or standing position.

Equipment. — Double screens are used for the purpose of obtaining more contrast with shorter exposure time.

A small diameter cone is used for the purpose of preventing secondary or stray radiation, in so far as possible, from reaching the film. This secondary radiation produces what is ordinarily called "secondary fog." Limiting the area of tissue exposed to the primary radiation by means of a cone, lessens the amount of secondary radiation delivered to the film.

An accurate time switch is necessary in order that exposures may be continuously duplicated.

A Bucky Diaphragm is not used because of the difficulty of making fractional second exposures with it, and because of the greater distance used.

A 5–100 radiator tube is recommended, or a medium focus universal tube may be used, because the large amount of energy required is too great for the smaller focal spots.

A stabilizer should be used in order that the milliamperage factor may be successfully duplicated.

Technic.—The time of exposure is fixed at three-tenths of a second in order that the danger of movement of the patient may be lessened.

A distance of six feet is used in order that distortion may be reduced to the minimum.

One hundred milliamperes is used so that the shorter exposure time may be used at a lower voltage, thereby increasing contrast.

With the above factors fixed, the radiographic density is controlled by varying the voltage (K.V.P.) with the autotransformer, the K.V.P. varying from 82 to 100 K.V.P., depending on the thickness and density of the region exposed.

Position of Patient, Tube and Cassette. —The patient is ordinarily placed sitting or standing in a true lateral position, with one shoulder resting firmly against the lower edge of the cassette, the tube centered to the cervical region.

CASE REPORTS AND NEW DEVICES

BILE DUCT OBSTRUCTION DEMONSTRATED BY THE SODIUM TETRAIODOPHENOLPHTHALEIN METHOD

By JOHN H. FITZGIBBON, M.D., PORTLAND, OREGON

Gall-bladder visualization by the sodium tetrabromphenolphthalein method of Graham and Cole,[1] and the sodium tetraiodophenolphthalein method of Whitaker, Milliken and Vogt,[2] is becoming an important aid in diagnosis of gall-bladder conditions. A case of obstructive jaundice examined recently presented interesting radiographic findings.

REPORT OF CASE

Mrs. F. E. M., aged 65, mother of twelve children, was first seen Sept. 28, 1925. She gave a history of abdominal distress occurring, off and on, for many years. During the last few months there had been abdominal distress, described as a sensation of heaviness, associated with frequent belching. The appetite had been poor all summer, and there was a marked loss of weight, which had been particularly noticeable during the three weeks previous to examination. Jaundice had been constant for several weeks, but the patient was unable to tell when it first appeared, as she did not notice it until told by others. The urine meanwhile had been very dark.

The past history was negative except for so-called "walking typhoid" in 1883, and two or three attacks of "sore throat," the last being in 1910. Her father died of heart trouble at 85, her mother of carcinoma of the liver when 74 years of age.

Fig. 1. Gall-bladder shadow before breakfast.

Physical examination showed deep jaundice, and loss of weight. The liver was moderately enlarged and tender. In the right upper quadrant, below the liver edge, could be felt a firm, tender mass which was thought to be the gall bladder.

The urine was dark with bile, and contained a moderate amount of albumin and casts. Stools were clay-colored and positive for occult blood with the benzidine test. The blood Wassermann examination was negative. Coagulation time five minutes. Hemoglobin 82 per cent, erythrocytes 4,420,000, leukocytes 7,200.

X-ray of the stomach showed no defects, but the duodenal cap contained a notch on the greater curvature.

On the above evidence, a diagnosis of obstructive jaundice was made. Because of recently stimulated interest in the oral administration of sodium tetraiodophenol-

[1] GRAHAM, E. A., and COLE, W. H.: Roentgenologic examination of the gall bladder. Jour. Am. Med. Assoc., 1924, LXXXII, 613.

[2] WHITAKER, L. R., MILLIKEN, G., and VOGT, E. C.: The oral administration of sodium tetraiodophenolphthalein for cholecystography. Surg., Gynec. and Obst., June, 1925, p. 847.

Fig. 2. Gall-bladder shadow one hour later.

Fig. 3. Gall-bladder shadow four hours later.

phthalein for gall-bladder visualization, it was decided to use this method on the patient, to see if additional evidence could be obtained.

Salol-coated pills were given, in the usual way, on the evening before cholecystography. Because of bile duct obstruction, it was feared that a marked reaction might result from absorption of the salt. To our surprise, there was only moderate nausea, and radiographs made the following morning showed a gall bladder of moderate size (Fig. 1). One hour later (Fig. 2), after the taking of a meal, the gall-bladder shadow was about 30 per cent increased in size. Four hours later (Fig. 3), it was about three times the original size.

This was considered definite confirmation of the diagnosis of obstruction of the bile duct, the increase in size of the gall-bladder shadow being caused by obstruction to the flow of bile secreted in response to the meal.

An operation, by Dr. William Holden, revealed a greatly thickened, tense gall bladder, containing one stone, which measured about 1×2 cm. The gall bladder was filled with thick sebaceous-like material. The common duct was not enlarged, and no pathology of the pancreas could be palpated. At the junction of the cystic and common ducts was a hard mass extending toward the liver. This was thought to be malignant. Cholecystostomy was done and a small piece of gall-bladder wall removed for examination. The pathologist reported marked chronic cholecystitis, with cholelithiasis, and possibly early scirrhous carcinoma.

SUMMARY

Salol-coated pills of sodium tetraiodophenolphthalein were taken by a patient with obstructive jaundice, with only slight reaction.

A satisfactory gall-bladder shadow was obtained, which increased markedly in size after the taking of food.

A gallstone present in the gall bladder was not seen on the film, probably because of thick gall-bladder contents surrounding it.

Marked change in size of a thickened, diseased gall bladder shows that considerable elasticity remains in spite of long-standing infection.

UNUSUAL BONE FORMATION IN THE PELVIS

REPORT OF A CASE

H. S. HUNSBERGER, M.D., San Francisco Hospital, San Francisco, California

The following data concerning a case of unusual bone formation may be of interest:

Mrs. F. T., a widow seventy years of age, and a Christian Science adherent, entered the San Francisco Hospital June 3, 1925, complaining of pain in the left hip. She had a temperature of 101 degrees, and her left hip was tender. The admission diagnosis was arthritis.

X-ray of the left hip revealed an old fracture of the neck of the femur, and the presence of a slender piece of bone anterior to the acetabulum. It was thought probable that this was a bone graft that had become misplaced. The patient, however, denied ever having been treated by a physician for a fracture. She admitted having had a serious injury four years before, since which time she had used a cane.

X-ray of the entire pelvis (Fig. 1) showed an ununited fracture of the neck of the left femur, with considerable upward and backward displacement of the shaft; fractures of both rami of the left pubis; marked expansion of bone at the site of the fracture in the inferior ramus, with very little calcium, the bone here being a mere shell. The slender bone above mentioned

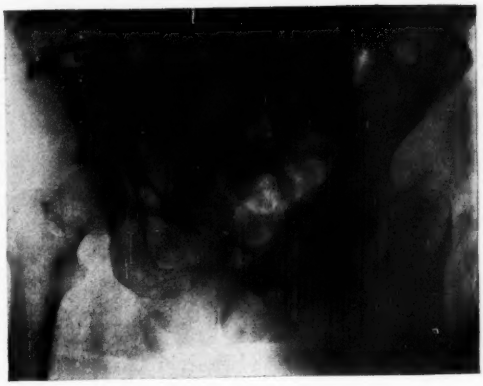

Fig. 1.

was seen to be 11 cm. long, approximately 1.3 cm. in diameter, and to extend downward and forward into the adductor muscles from the site of the fracture in the superior ramus. This bone had a cortex as thick as that of the femur itself, and a medullary space, but bony trabeculæ were not clearly shown.

The results likely to be obtained by operation were not considered commensurate with the risk involved, and the patient was discharged with a support for the hip.

The question of the origin of this bone is interesting. Was it a congenital anomaly or the result of injury? Consultation with Dr. A. W. Meyer, Head of the Department of Anatomy at Stanford University, and a study of the specimens in the Anatomical Museum, confirmed the view that it was the result of a periosteal tear at the time of injury.

COOLING THE DEVELOPER

By JOHN A. HERRING, M.D., St. Petersburg, Florida

There are times during the summer months when the temperature of the developer and the incoming water is so high as to cause considerable trouble in the dark room. In Florida, this is true nine or ten months out of the year, and icing is abso-

lutely necessary. One cannot always obtain an even temperature by putting ice in the tanks; besides, this method is always troublesome, and the ice man may come in at any and all times, more often before you get to your office.

The newer methods of electrical refrigeration have impressed the writer very much and the idea has been applied to the developing tank.

A "Frigidair" ice cream cooler is put into a large master tank, and the developer and fixing bath are placed in the 14 × 17 enamel or hard rubber tanks and set into the master tank, which is filled with water. The "cooler" may be put in the middle or at the end, and the inserts on either side or together. By the simple turn of a switch the whole thing is cooled to the required degree, and, once it is at 65°, it can be kept there with very little effort.

For washing, one may use a separate tank entirely (the old stone tank will do), or one can be built in one end of the master tank but insulated from it.

The temperature must be watched and the cooler turned off when the temperature is down to 65°, as the machine does not work automatically at such a high temperature. The writer is working on a switch that will set into the master tank.

A brief description of the tank is all that is necessary, and any model or modification can be made to suit one's needs. It is simply a large tank made of 16 or 20 gauge Armco iron or 4-pound sheet lead with a hole in one side for the "cooler." This tank is insulated with cork or Celotex and boxed over, leaving the necessary openings for the drains and overflow. A suitable insulated top is made to cover it. The tank measures 36 inches long by 17 inches wide by 22 inches deep. It will accommodate four of the inserts.

The complete outfit will cost about three hundred and fifty dollars, but it will soon pay for itself in eliminating the cooling problem from your mind.

X-RAY FINDINGS IN A CASE OF APPENDICEAL ABSCESS OF ONE YEAR'S DURATION

By IRVING SCHWARTZ, M.D., Roentgenologist, Knickerbocker Hospital; Assistant Roentgenologist, Bellevue Hospital, NEW YORK

Appendiceal abscess, though common enough in any busy surgical service, is for obvious reasons unusual in the X-ray laboratory. It is on this account that the following case is reported.

R. F., a married white woman, aged 31, was admitted to the Knickerbocker Hospital, October 21, complaining of recurring attacks of cramp-like pain in the right lower quadrant of the abdomen, nausea and vomiting, for the preceding year. Five months before admission she had been confined to bed with an especially severe attack lasting several days, since which time she had been losing weight and strength. The attack which brought her to the hospital at the time of admission had lasted three days.

On physical examination her general appearance showed the evidence of chronic

Fig. 1.

disease of moderate severity. Her abdomen was somewhat rigid. There was moderate tenderness over McBurney's point and under this was a palpable mass about 2 inches in diameter, spherical, smooth and resilient. This mass was also palpated vaginally. Her temperature on admission was 100.4° F., pulse rate 96 per minute, blood count 5,400—74 per cent polymorphonuclear leukocytes. Within forty-eight hours her temperature became normal, and remained normal till her operation, three days later.

Appendiceal abscess was regarded as the most probable diagnosis, but because of the long history, the diagnosis of tuberculosis of the cecum was considered.

Radiography of the chest showed no evidence of phthisis. The accompanying illustration (Fig. 1) is a radiogram of this patient after the introduction of a barium enema. The smooth indentation on the medial aspect of the cecum and the position and course of the terminal loop of ileum were found constant in fluoroscopy and all of the radiograms. The roentgen diagnosis was extra-cecal tumor mass, with a loop of terminal ileum adherent to it.

At operation, performed by Dr. John Douglas, an abscess was found in the right lower quadrant, tightly wrapped in a thickened omentum. The abscess cavity contained an ounce of thick, creamy pus. A thickened, distorted appendix was adherent to the posterior wall of the abscess cavity.

This mass, and the hollow viscera adherent to it, corresponded exactly with the roentgen findings.

RADIOLOGICAL MEETING AT CHAMPAIGN, ILLINOIS, MAY 18

There will be a joint meeting of the Central Illinois Radiological Society and the Chicago Roentgen Society at Champaign, Illinois, Tuesday, May 18, during the annual meeting of the Illinois State Medical Society. A splendid program has been arranged and all physicians interested are invited to attend. A copy of the program may be obtained from Harold Swanberg, M.D., 731 Hampshire St., Quincy, Illinois, President of the Central Illinois Radiological Society.

EDITORIAL

THE LIBRARY OF THE RADIOLOGICAL SOCIETY OF NORTH AMERICA

The scientific exhibit, which has the greatest potentiality of anything connected with the Radiological Society of North America, has long been neglected by it. Provision has been made at every meeting for this phase of the Society's activities, but only the enthusiasm of a few of the members has saved it from falling completely into the discard. In fact, most of the plates and films have been exhibited by men who have had problems of diagnosis to solve and carried the plates or films to the meetings for consultation with men of wider experience than themselves. During these consultations it has frequently developed that similar cases have been noted, the plates of which are filed in the larger laboratories or are isolated in the individual collections of men throughout the country.

It seemed, therefore, that there existed an opportunity for the Society to develop an institution that could carry on throughout the year the work that heretofore has been confined to the short time of the meeting. The individual roentgenologist wants help at the time a case is seen; by the time the annual or sectional meeting has arrived his case may have been forgotten; circumstances may not permit his attendance at the meeting, and the hope of enlightenment or suggestion is lost; the men considered most competent to discuss the cases may not attend the meeting, or may not be available. In any one, or a combination, of such circumstances, the Society has lost a contact point with the individual member that might have been mutually helpful.

The institution that might best carry on this work seemed to be a library of interesting films, reproductions of the original films and plates, of standard size, mounted, and accompanied by brief but comprehensive legends. The procedure suggested was that the members should send the original films or plates to the librarian, together with all history and notes available, and that the librarian would have the reproductions made and return the originals to the contributor, keep a record of the notes, and arrange the legends, acknowledging in the legend the contributor of the individual case. In the working out of this plan, new possibilities have already presented themselves, and an attempt will be made to enlarge the scope of the plan to cover these. A few of the cases already presented have suggested the establishment of a consultation board by the Society, to the members of which the copies may be sent for opinions, to be incorporated in the notes and forwarded by the librarian to the contributor.

The copies, with all the notes, will be the property of the Society, and they will be grouped and filed, indexed and cross-indexed, and made available to the members as facilities can be created to do this.

The library will then be made the basis of the annual exhibit; from its files will be drawn sufficient new and interesting cases to fill the view boxes available through the local committees of the individual meetings. All the new material of each year would be included in each exhibition. Adopting a standard size will make possible the shipping of the view boxes from city to city, thereby saving the effort and expense of the local committees and greatly increasing the efficiency of the committee on local arrangements.

Through the efforts of the librarian the individual members may be stimulated to submit for publication in the Society's journal reports of interesting cases, thereby still further increasing the value of the journal. A loan exhibit sent by the Mayo Clinic to the International Congress of Radiology at London last year has been the subject of enthusiastic comment by some of the British radiologists, and the request for permission to copy many of the plates has suggested the possibility of exchanges with international societies to broaden the field of the subjects in the Society library.

Through the efforts of one of our former presidents, the Wayne County Medical Society, in their cancer-week meeting last year, had a loan exhibit of films covering certain phases of malignancy, and this year the Detroit Roentgen Society will have a loan exhibit of 100 films of atypical lesions of bone. There are, no doubt, many county, state, and other societies to which the Radiological Society of North America, through its members, could offer loan exhibits for their meetings and particularly for special propaganda campaigns carried on at the time of these meetings. There are other ways in which the library may serve the individual members of the Society and also the profession at large, which will no doubt present themselves with the development of the plan.

The success or failure of the library rests entirely with the individual members of the Society. Those who expect to reap, must at first sow. Such an institution will require a little time and effort of many, and much time and effort of a few. If all will cooperate freely the success of the library is assured. There are, no doubt, large and small collections of interesting cases in every laboratory in the country; if these can be assembled in one great clearing house, the science of radiology will take great strides. One has but to see the various types of lesions to have their characteristics fixed in the memory; to discuss them with fellow-members at the annual meetings would enhance the impression. Many of the leaders of the profession have expressed their sympathy with this movement; action on their part would assure the establishment of the library, and material from those of lesser opportunity would go a long way toward building this institution in which the Society can greatly extend the scope of its usefulness. If each member makes this his personal responsibility, the success of the library is assured.

CHARLES G. SUTHERLAND, M.B. (Tor.)

FURTHER ECONOMY

Further economy, in addition to the step recently taken by the Society in the abolition of the Summer Meeting, is necessary. Medical societies, either special or general, should promote economic welfare as well as distribute scientific data.

TOO MANY MEETINGS
IMPORTANT RESOLUTION

The past two decades have seen the science of radiology emerge from a state of experimental investigation and develop into what is perhaps the most outstanding and far-reaching specialty of medicine and surgery.

During this time there have been formed in North America at least four societies of national scope through whose individual efforts and single purpose the dignified and scientific elevation of radiology has been gradually accomplished.

It is a matter of fact and record that fully three-fourths of the combined radiological personnel of North America are members of and pay dues to two or more of these societies, and it naturally follows that each individual is expected to actively participate in the progress of his radiological affiliations.

A great many of the members of the societies in question, in a spirit of altruistic loyalty to their work, attempt to live up to their ideals at a cost of time and money

which is almost prohibitive. This is particularly true of the members who live far away from the central marts of the United States, who, in order to be good and faithful members, feel compelled, each year, to make three separate and distinct journeys to these far-flung locations in America for this purpose. Now, in the light of common sense and plain business reasoning, this is a burden for which a remedy must be found. A plan to accomplish this desired end is briefly outlined.

Form a union or amalgamation of the existing societies under a common name and in a manner which meets the approval of each component society, the method of this amalgamation to be determined by a representative committee from each society, which shall bring the result of its deliberations and conclusions before its own unit society for action.

This committee might bear in mind that inasmuch as the American Medical Association now has an active Section of Radiology, which meets with its parent body each year, that the new association, if formed, select a time as remote as possible from that of the American Medical Association and at such a place as will serve the best interests of the largest proportion of its membership. It would seem wise to choose a point, each year, opposite to that selected by the American Medical Association. In this manner every section of the United States would have an equal opportunity to at least once a year be more or less accessible as a major radiological meeting place, with a minimum loss of time and expense. One outstanding benefit of this proposed union is, of course, that members pay dues to one society, not several. The manner of the details of amalgamation, together with the journal problems and other vital matters, would have to be carefully considered in order that no wrong or injustice be meted out to any individual member or to the constituent societies. For the purpose of bringing this matter to the attention of the Radiological Society of North America, the following resolution is respectfully submitted:

RESOLUTION

WHEREAS, there now exist several societies of national scope, whose aims are to foster, protect and develop the science of radiology in its different phases, and

WHEREAS, two journals devoted to such interests are now maintained, either separately or conjointly, by these societies, and

WHEREAS, this has made it necessary for many of the radiologists of North America to become members of more than one of these societies, to subscribe to more than one of these journals, and to attend several meetings, held each year in different parts of the continent, and

WHEREAS, such a situation has tended to cause diffusion of effort and attention and to weaken the position of radiology as related to the other phases of medicine,

BE IT THEREFORE RESOLVED, in the interests of American Medicine as a whole and of American Radiology in particular, that a committee be appointed to study the various angles of this question, to sound the attitude of the members of these different societies, and to formulate ways and means of bringing about an amalgamation.

ALBERT SOILAND, M.D.
A. U. DESJARDINS, M.D.

In accordance with the above resolution the following committee was appointed: Dr. Albert Soiland, representing the West; Dr. Burton J. Lee, representing the East, and Dr. M. J. Hubeny, representing the Central States.

Dr. Arial W. George, of this Society, has been granted the Diploma in Medical Radiology and Electrology from the University of Cambridge, England, this being an Honorary Diploma granted for an original thesis submitted to a special board of medicine.

The roentgenologists in Great Britain must receive this diploma before they may

be appointed to positions in the larger institutions, and to obtain this they must attend the University for a period of six months. Up to October 1, 1925, however, the University conferred this as an Honorary Diploma to any roentgenologist in the world who could submit an original thesis on a subject pertaining to our specialty, has been in the practice of roentgenology for ten years or more and has served as roentgenologist to a qualified hospital for five years or more.

ACTIVE COMMITTEES OF THE ANNUAL MEETING OF THE RADIOLOGICAL SOCIETY OF NORTH AMERICA, TO BE HELD IN MILWAUKEE, NOVEMBER 29 - DECEMBER 4, 1926

Executive Committee:

DR. H. B. PODLASKY, Pres. Milwaukee County Radiological Society, *Chairman*
DR. C. W. GEYER, Sec. Milwaukee County Radiological Society
DR. F. W. MACKOY

Advisory Committee:

DR. ROCK SLEYSTER, *Chairman*, Vice-speaker House of Delegates, American Medical Association
DR. J. F. SMITH, Pres. State Med. Society
MR. J. G. CROWNHART, Sec. State Med. Society
DR. S. J. SEEGER, Pres. Milwaukee County Medical Society
DR. E. L. THARINGER, Sec. Milwaukee County Medical Society
DR. C. H. DAVIS, Pres. Academy of Medicine
DR. D. E. W. WENDSTRAND, Sec. Academy of Medicine
DR. M. H. MORTONSON, Pres. Wisconsin State Dental Society
DR. R. W. BLUMENTHAL, Ex-pres. Milwaukee County Medical Society
DR. C. R. BARDEEN, Dean University of Wisconsin Medical School
DR. L. JERMAIN, Dean of Marquette University Medical School
COL. C. R. PEARSALL
DR. J. C. SARGENT
DR. W. F. LORENZ
DR. G. L. BELLIS
DR. J. L. YATES
DR. G. V. I. BROWN
DR. H. M. BROWN
DR. A. J. PATEK
DR. C. A. EVANS
DR. G. SEAMAN
DR. W. C. F. WITTE
DR. M. L. HENDERSON
DR. D. W. ROBERTS
DR. F. J. GAENSLEN
DR. R. MORTER
DR. M. BORNSTEIN

Hospitality Committee:

DR. J. MCMAHON, *Chairman*
DR. D. W. ROBERTS
DR. C. A. H. FORTIER
DR. NEWTON SISK
DR. W. ACKERMAN
DR. J. L. YATES

Scientific Exhibit Committee:

DR. H. R. FOERSTER, *Chairman*
DR. F. HODGES
DR. I. JOSEFSBERG
DR. A. M. DORR
DR. E. SMITH

Commercial Exhibit Committee:

DR. J. J. SEELMAN, *Chairman*
DR. W. SICKLES
MR. C. KARRER
MR. F. MCINTOSH
MR. H. PENGELLY

Hall Committee:

DR. W. EGAN, *Chairman*
DR. J. A. FROELICH
MR. L. MASSAPUST
MR. C. KARRER
MR. F. MCINTOSH
MR. H. PENGELLY

Hotel Committee:

DR. A. R. ALTENHOFEN, *Chairman*
DR. H. CURL

Hospital and Clinic Committee:

DR. P. S. EPPERSON, *Chairman*
DR. E. SMITH
DR. A. J. WEBER

Publicity Committee:
DR. C. W. GEYER, *Chairman*
DR. A. M. DORR, *Reporter*
DR. H. B. PODLASKY
DR. M. H. MORTONSON
MR. J. G. CROWNHART
MR. E. L. FERGESON
Reception Committee:
DR. G. W. STEVENS, *Chairman*
DR. GENTZ PERRY
and all members of the Milwaukee County Radiological Society
Transportation Committee:
DR. J. J. SEELMAN, *Chairman*
DR. J. S. JANSSEN
Entertainment Committee:
DR. G. W. STEVENS, *Chairman*
MRS. C. W. GEYER
Wives of all members of the Milwaukee County Radiological Society
Registration Committee:
DR. H. CURL, *Chairman*
Joint Meeting Committee:
DR. F. W. MACKOY, *Chairman*
DR. W. J. EGAN
DR. R. W. BLUMENTHAL
DR. H. M. BROWN
FATHER FOX

BOOK REVIEWS

PHYSIOTHERAPY—THERAPY AND CLINICAL APPLICATION. By HARRY EATON STEWART, M.D., President-elect, American Academy of Physiotherapy; Attending Physiotherapist, U. S. Marine Hospital, N. Y.; Director, New Haven School of Physiotherapy; formerly Assistant Director, Section of Physiotherapy, Office of the Surgeon General, and Supervisor of Physiotherapy, U. S. Public Health Service. Paul B. Hoeber, Inc., 1925, New York. Pages 351, price $7.50.

A book of 351 pages, dealing with all phases of physiotherapy — made plain enough for the general practitioner and physiotherapist. It approaches the subject from a scientific standpoint, giving, briefly, so far as is now known, the effects of the various physical methods employed.

Various chapters are devoted to ionization or electrolysis, galvanism, faradism, static and high frequency currents. Phototherapy is dealt with to a considerable extent, explaining the effect of heat and radiant light, diathermy, ultra-violet rays and the various methods of their application. The usual space is given to exercise, massage and hydrotherapy.

Although the author is frank in his statements in regard to the limitation of the usefulness of various treatments, there is such a bewildering number of symptoms and diseases supposedly relieved or cured by physiotherapy that it would almost seem as though other remedies were superfluous.

Facial paralysis, neuritis, sciatica, neurasthenia, anemia, myositis, torn muscle insertions, synovitis, fractures, rickets, bone tuberculosis, osteomyelitis, arthritis, bursitis, phlebitis, cardiac disease, arteriosclerosis, pyorrhea, gastritis, cholecystitis and appendicitis are only a few of the conditions to be treated by physiotherapy, though the author does not claim equally good results in all conditions and diseases. The experienced physician will find this book very helpful.

A. G. HOWARD, M.D.

INTERNATIONAL CLINICS. Thirty-fifth Series, March, 1925.

The last edition of the International Clinics has just appeared, and many hours may be well spent in reading the very instructive and interesting articles in all branches of medicine of which it is composed. There are nineteen articles, with fifty-four fine illustrations. The articles are prepared by the leading members of the medical profession of the world.

The Medical Section is composed of the report of an unusual case recovering from staphylococcus septicemia, with meningitis, thrombophlebitis, embolic pneumonia and nephritis. There are nine other articles on the diagnosis and treatment of some of the more unusual diseases.

To one interested in mental disturbances the articles on "The Psychology of Paranoia," "Amnesia and Pathological Stealing" and "Psychoneuroses in Relation to General Medicine," found in the Section on Mental Disturbances, will be particularly interesting.

The last eighty pages of the quarterly are composed of a collection of brief abstracts on the recent advances in medicine. These cover a remarkable number of subjects, and, while short, give much information on the new methods used in medicine.

B. C. CUSHWAY, M.D.

LA CURIETHERAPIE DES CANCERS. By SIMONE LABORDE, Chief of the Radium Laboratory of the Villejuif Anticancer Center. Pages 333, with 43 illustrations. Paper. Masson & Co., Paris. Price 27 francs.

This volume of moderate size represents the current views and opinions of the best French radiologists on the use of radium in cancer. The subject-matter is well arranged, the discussions and descriptions quite clear, and the details of technic very complete. The opinions advanced are generally sound. Exception might be taken to the discussion of so-called stimulative effects claimed by some radiologists to follow radiotherapy under certain conditions. This notion of stimulation has little real basis and the occurrence of such stimulation is very questionable except as a temporary phase. Little evidence has ever been brought forth to support the notion that X-rays or radium can bring about continued acceleration of cell-growth or increase the real growth of the tumor.

The book is well printed and the illustrations are of good quality. An extensive bibliography, together with a complete index, are provided. This work deserves to be read by every physician specializing in radiology and others who may wish to keep informed concerning the more advanced ideas on this subject.

A. U. DESJARDINS, M.D.

MEDICAL EDUCATION: A COMPARATIVE STUDY. By ABRAHAM FLEXNER. Pages 334. The Macmillan Company, 1925. Price $2.50.

This book is a comparative study of medical education in Europe and America in which the author discusses the relation of medical education to the general educational and social systems of the respective countries. He divides the medical schools into three types: the clinical, as represented by France; the university, as typified by Germany, and proprietary, as represented by the early American school. Each type is described and many illustrations cited.

Pre-medical education, as developed in the different countries, is also considered, and the necessity for studying the basic sciences and modern languages is emphasized. The medical curricula of the various countries in Europe and America are also compared and discussed, and the relation of laboratory sciences and clinical subjects in the various universities is fully considered. The final chapters are devoted to a discussion of medical research and the cost of maintaining teaching institutions.

On the whole, the book presents a clear, concise survey of present methods of teaching medicine not only in this country but in Europe, and should be of great interest to every teacher of medicine.

GEORGE W. HOLMES, M.D.

LIGHT AND HEALTH. By M. LUCKIESH, Director, Lighting Research Laboratory, General Electric Company, and A. J. PACINI, Director, Department of Biophysical Research, Victor X-ray Corporation. Williams and Wilkins Co., Baltimore, Md., 1926. Pages 302, price $5.

The authors have attempted to sort out a sufficient amount of data, which, in their judgment, is acceptable, for presenting a picture of the relationship of radiation to life and health.

As a whole, the book is founded upon data which appear to be well established and suggestive, as well as upon considerable experience from two different viewpoints. The material has been presented in a manner as free as possible from specialized technical terms without sacrificing accuracy.

The physician as well as the layman will find much of interest in this comprehensive discussion.

J. D. CAMP, M.D.

ABSTRACTS OF CURRENT LITERATURE

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Treatment of hyperthyroidism at the Lahey Clinic.—Compound solution of iodin has been used in the treatment of 200 cases of primary hyperthyroidism in the Lahey Clinic. A study has been made of the effects of this treatment in this group of cases, of which 69 have been especially selected for detailed presentation.

Rest in bed for from seven to ten days before operation is of great importance in pre-operative preparation. Before the use of this solution and rest in bed, only 38 per cent of the patients were operated on in one stage. Since the use of the solution and rest in bed pre-operatively, 63.7 per cent have been operated on in one stage. The number of pole ligations has decreased from 51 per cent in the past, to 13 per cent in this series of cases. In the 85 cases of primary hyperthyroidism in which operation was performed during the first five months of 1925, no pole ligation has been necessary. Of the patients in this group, 7.2 per cent failed to show an appreciable drop in metabolic rate after the use of the solution and rest.

The results following subtotal thyroidectomy performed in one operation or by two hemithyroidectomies are similar.

Iodin administered over long periods without thyroidectomy does not cure exophthalmic goiter. Thyroidectomy must be added to produce a complete return to normal health.

W. W. WASSON, M.D.

Effect of Compound Solution of Iodin and Rest in Surgery of Exophthalmic Goiter. Howard M. Clute. Jour. Am. Med. Assn., Jan. 9, 1926, p. 105.

Radio-active substances. — The cases described in this paper represent practically a hitherto unrecognized form of occupational poisoning. The anemias encountered are for the first time actually proved to be due to the ingestion of radio-active elements, with deposition of insoluble, fixed particles in the phagocytic cells of the sinusoids of the reticulo-endothelial system, where they continuously emit irritative rays, which in time produce exhaustion of the adjacent hematopoietic centers.

The necrosis of the jaw, which forms an important lesion in this disease, is due to local irritative radiation at the portal of entry, produced by clinging particles of radio-active substances on the gums, teeth and roof of the mouth, activated by increased bacterial virulence of the organisms in the mouth caused by the irritative or stimulative effects of small amounts of radiation. The increased virulence of bacteria when exposed to small doses of radio-activity is in itself a subject requiring further investigation. Occasionally the buccal lesions and maxillary necroses have occurred late in the course of the anemia, but usually they precede the anemia or are early symptoms.

The authors believe this is the first time that radio-activity has been demonstrated in the human body during life by means of electrometers. In the organs after death Reitter, Martland and Barker, in an independent observation, demonstrated the presence of radium, mesothorium and their decayed products, especially in the lungs of a chemist and physicist who had died of an acute leukopenic anemia of the pernicious type, due to the inhalation of radio-active dust and emanation. The quantitative results of this case are about to be published. These two investigations probably represent the first readings of the kind that have been made on human viscera. The present writers have made check tests for alpha radiation with normal tissues prepared in the same way as the tissues in these cases, and have found no radio-activity in specimens from spleen, liver, bone, lungs, heart, kidneys, brain, and numerous samples of biliary and renal calculi. It is of particular interest that the examination of both metabolic cholesterin and infectious gallstones was negative for radio-activity, because Lazarus-Barlow of St. Bartholomew's Hospital stated several years ago that he had found certain biliary calculi radio-active, and advanced the theory that cancer of the gall bladder might be, at times, due to this condition.

The electroscope or electrometer, as far as we know, has not hitherto been employed for the demonstration of radio-activity in the expired air. It is of very great clinical importance, since active deposits of radio-active elements can be shown in the human body months and years be-

fore clinical symptoms appear. The writers have made numerous check tests on normal individuals and have not found any radio-activity. In the case of a physicist who had handled large amounts of radium or mesothorium, and who, four years ago, had a severe anemia with loss of several teeth but is now in very good health, Martland, Conlon, and Knef have been able to demonstrate, even four years after contact with mesothorium, a large amount of emanation in the expired air, coming from mesothorium and radium and their decayed products.

After radio-active elements are once deposited in the body, there is no known way of eliminating, changing or neutralizing them. They diminish in amount only according to their individual characteristic decay. Radium takes 1,750 years and mesothorium 6.7 years to reach one-half of its original activity. The writers have been trying to influence the infection occurring in these cases by intravenous injections of rapidly oxidizing colloidal solutions, and to influence the deposits by exposure of the body to quartz light. An individual impregnated with such deposits is always in grave danger of dying from a severe anemia, developing years after their original deposition and under conditions in which the real etiology may be obscured or never suspected. The authors know of five deaths from such deposits in which the cause of death was variously attributed to sepsis, mouth sepsis, anemia, necrosis of jaw, syphilis and Vincent's angina.

There is a voluminous literature on the experimental production in animals of various forms of anemia by the use of radio-active substances. This is a well established fact. The demonstration of radio-activity in such amounts as was found in these cases, taken together with experimental animal work, establishes the cause of the anemia.

From the experience of Martland, Conlon and Knef, it would appear that the intravenous injections of long-lived radio-active elements or the internal administration of radium, mesothorium or radio-thorium is highly dangerous on account of the harmful effects. It is not warranted in any medical condition, as none of the known radio-active substances produce any specific or curative results. The supposed beneficial effects from the early irritative stages might only be countenanced in the treatment of leukemias, Hodgkin's disease, etc., in which the end is expected in a short time. This does not apply to the use of short-lived emanation. The value of radium waters is questionable, since most of them at the time they are taken contain little or no radio-activity. Should the waters contain radium or mesothorium in solution, their use would be distinctly dangerous on account of late cumulative effects.

An important etiologic factor has been established in the causation of obscure diseases of the blood. The writers now know that a pernicious type of anemia may be caused by minute amounts of radio-active substances being stored in and adjacent to the blood-forming centers.

In view of their experience it would seem advisable to test expiratory air for the presence of radio-activity in all workers in radio-active substances who develop anemia, buccal lesions and similar conditions.

In the etiology of obscure blood diseases, it might be easy to conceive of various bacterial and cellular toxins in minute amounts, ultramicroscopic organisms or bacteriophages, producing similar general or selective action on the hematopoietolytic systems. For example, the pathologic stimuli, whatever they are, responsible for Hodgkin's disease, may be very minute in amount and have very selective action, producing increased activity of lymphoblastic centers (hematopoietic system) and increased activity of the cells of the reticulo-endothelial system in the lymph, spleen and bone sinusoids (hemolytic system), resulting in almost a neoplasia, characterized by lymphoid hyperplasia, peculiar multinucleated and giant cells originating from local histocytes of the reticulo-endothelial system, fibrosis, necrosis and eosinophilic infiltration.

W. W. WASSON, M.D.

Some Unrecognized Dangers in the Use and Handling of Radio-active Substances, with Especial Reference to the Storage of Insoluble Products of Radium and Mesothorium in the Reticulo-endothelial System. Harrison S. Martland, Philip Conlon, and Joseph P. Knef. Jour. Am. Med. Assn., Dec. 5, 1925, p. 1769.

Blood catalase and ultra-violet radiation.—The effect of ultra-violet radiation on the catalase of the human blood was studied by exposing a suspension of carefully washed human erythrocytes in 0.9 per cent NaCl solution to from one to ten ultra-violet units. No change could be detected. The pH of the solution had also no influence. This result is in conflict with the opinion stated in almost all text-books.

E. A. POHLE, M.D.

The Effect of Ultra-violet Radiation on the Catalase of Blood. F. Peemöller and H. Franke. Strahlentherapie, 1926, XXI, 165.

The dentist as a medical specialist.—The author points out the great advances being made by the dental profession in recent years, and expresses the hope that soon the dental profession will be regarded as a medical specialty in

the same way as the eye, ear and nose specialty is regarded now. At the present time in the University of Alberta the preliminary studies leading to the degree of D.D.S. and M.D. are conducted in the same class rooms.

One of the most important reasons why the medical profession is realizing the importance of the well trained dentist is the discovery of the important rôle that focal infection plays in the causation of systemic disease. Among these infections, dental foci play a rôle of predominating importance. So strikingly true is this that the dental surgeon is concerned more with the general health of the patient than with the repair and replacement of teeth.

The contribution of the radiologist to the dental surgeon.—Since abscesses at the roots of devitalized teeth play such an important part in the production of endocarditis, rheumatism, neuritis, gastric ulcer, and appendicitis, and since it is only by an extensive and systematic examination by means of the X-ray that these abscesses are discovered, it is apparent the great part which the radiographer plays in dental diagnosis and treatment. By means of the radiograph the dental surgeon has become aware that about 90 per cent of devitalized teeth have either no fillings or incomplete ones. Fully 75 per cent of these teeth show destruction of the bone and infection about the apical ends of the roots. The employment of the X-ray removes the diagnosis of dental disease from the realm of guess-work to one of comparative positiveness. The same may be said of the indications for and the results of treatment.

The author stresses the need of collaboration with the rhinologist in the differentiation between apical infection and antrum disease in the upper alveolar region.

A word of caution is uttered concerning the manner of making and interpreting X-ray films of teeth. This should be done only by a competent radiologist, the practising dentist having neither the time nor training to make and develop dental radiographs. The technician has neither the training in special dental or general pathology to make his report of any value; the dental X-ray specialist usually has not the training in general pathology requisite to relate the dental findings to general disease. There remains only the trained radiologist to make and interpret the dental films. In this connection the author warns radiologists that they have not in the past given the time and study to dental radiography that its importance demands. The dental film should be equally as good as that of the chest or spine. There should be a sufficient number of correctly exposed films to show all the suspected areas, and to show them at different angles. Dental films have to be repeated much more frequently than those of any other part of the body to get correct results. Usually fourteen films will have to be taken to show a complete radiograph of a full set of teeth. Every tooth should be presented from at least two angles. This is a standard rule in making exposures of bones, and the teeth should be no exception.

L. J. CARTER, M.D.

The Importance of the Dental Surgeon in Medicine and the Value of Radiography in Dental Practice. Bernard R. Mooney. Canadian Med. Assn. Jour., Dec., 1925, p. 1245.

Intravenous injection of dye for functional tests.—The authors have searched for and found a dye which, while giving a sufficiently dense gall-bladder shadow upon the X-ray film, also colors the blood sufficiently to permit an estimation of liver function by the Rosenthal method, and is excreted by the urine to a sufficient extent to permit a colorimetric estimation of kidney function. The dye used is phenoltetraiodophthalein, an isomer of tetraiodophenolphthalein. It must, of course, be used intravenously to permit the performance of the three tests simultaneously.

CHARLES D. ENFIELD, M.D.

Simultaneous Cholecystography and Tests of Hepatic and Renal Functions. E. A. Graham, W. H. Cole, G. H. Copher, and Sherwood Moore. Jour. Am. Med. Assn., Feb. 13, 1926, p. 467.

Spinal metastasis from breast carcinoma.—The author makes note of the paucity of literature on the subject. The main American contributions have been made by Pfahler, Moore, and Carman. Study of this literature, together with a striking coincidence of cases in the author's own practice, leads to the conclusion that spinal metastasis from breast carcinoma is more frequent and more important than commonly recognized. Of 54 cases of breast carcinoma in the author's own series there was recurrence or metastasis in 21. One-third of these were metastases in the spine. Four simultaneously occurring case histories,—in which there was spinal metastasis following radical operation and subsequent X-ray therapy,—are studied.

The conclusions reached are as follows: 1. There is a characteristic symptom which should place the physician on his guard. That symptom is pain. That pain is bilateral in distribution. At first it radiates along the line of distribution of the nerves taking origin at the segment of spine involved. Later the pain localizes at the site of the lesion. 2. The lesion itself may not be demonstrable until many months after the

onset of the characteristic pain. When demonstrable, it assumes an osteoclastic type of process in the upper lumbar and dorsal vertebræ, and an osteoplastic type of process in the lumbosacral and sacro-iliac regions.

The treatment of the lesion by deep X-ray therapy is usually disappointing, although some brilliant results are recorded.

Spinal Metastasis from Breast Carcinoma. L. J. Carter. Can. Med. Assn. Jour., Jan., 1926, p. 48.

Permeability of cells under radiation.—The changes of the permeability of the erythrocytes for methylene blue under X-ray radiation were studied by adding to 10 c.c. of defibrinated and then irradiated blood in a centrifuge tube, 1 c.c. isotonic methylene blue solution. This mixture was centrifuged for five minutes and the methylene blue of the plasma measured by a colorimeter. With increasing doses, the dye content of the plasma increased. If the time of centrifuging is lengthened to three hours, most of the dye is resorbed by the red blood corpuscles. The phenomenon is explained by absorption; the membrane changes its electrical characteristics and, therefore, its permeability under X-ray radiation.

E. A. POHLE, M.D.

Further Observations of the Changes of Cell Permeability under X-ray Radiation. K. Brummer. Strahlentherapie, 1926, XXI, 3, p. 447.

Desiccation and electrocoagulation.—The necessity of using radium, roentgen rays and surgery as well as electrothermic methods in the cases cited is emphasized. The differences and the respective advantages of desiccation and electrocoagulation are brought out. The desiccation is secured by means of a monopolar current of high voltage and low amperage. It is used chiefly when the lesion is localized and when good cosmetic results are essential, as it is followed by little fibrosis and its action can be very accurately controlled. Among suitable fields for its application are mentioned growths on the vocal chords, bladder and rectum, corneal ulcers, cervical erosions, urethral caruncles, moles, papillomas, leukoplakia, as well as malignancies of the skin and mucous membranes. Coagulation is produced by a bipolar current of lower voltage and higher amperage, using a multiple spark gap. By this means tissues may be destroyed to any desired extent. The strength of current is gauged by a milliammeter. The author prefers a method employing a large indifferent electrode, with the active electrode in the form of a needle. The Doyen method is mentioned, largely to condemn it. With either method, the aim should be to destroy the growth at a single operation. Devitalized tissue should usually be removed immediately, except in mucous membrane work, where it is usually better to allow the tissue to separate spontaneously. Bone which has been treated will sequestrate in about six weeks. Large blood vessels which are to be included in treated areas should be ligated prior to treatment.

To quote the author: "In dealing with localized benign or malignant lesions, the superiority of electrothermic methods over irradiation is shown by definite histologic changes and by comparison of permanent clinical results."

Lesions can be treated a second or third time without the results being prejudiced by the fact of previous insufficient treatment. The vitality of surrounding tissue is not depressed. Post-treatment fibrosis is distinctly less with this method than with irradiation. Many commercial high frequency machines are not suited for this type of work and the author has found it necessary to have apparatus built to suit his needs.

These methods are essentially surgical and good results will be secured only by those having some surgical background as well as a thorough familiarity with the apparatus they are using.

Detailed description of an amputation of the tongue is given.

An account is given of histologic studies of the tissues after coagulation and desiccation. The characteristic effect of desiccation is a shrinking of the cells, with condensation and elongation of the nuclei, thrombosis in the blood vessels, without evidence of hemorrhage. Following coagulation, the cell outline was entirely lost and the tissues fused into a homogeneous mass. In laboratory animals it was noted that there was round cell infiltration around the treated areas, in some places localizing around the blood vessels. These changes are characteristic and constant.

The mechanism of action of the two methods is adequately indicated by the names given them.

CHARLES D. ENFIELD, M.D.

Electrothermic Methods in Treatment of Neoplastic and Allied Diseases. William L. Clark. Jour. Am. Med. Assn., Feb. 27, 1926, p. 595.

Transverse slits in vertebræ.—The author quotes a case in which the lateral radiograph of the spine showed a horizontal slit running through the body of certain vertebræ, this occurring in the tenth, eleventh, and twelfth thoracic. Postmortem examination of the spine showed a horizontal channel running through the center

of the body of each of these vertebræ, dividing each body into an upper and a lower segment. These channels contained veins, which, by reason of their increased caliber, made the areas so excavated show on the radiographic film. They must not be confused with fractures or other pathological processes.

L. J. CARTER, M.D.

Anatomical Note on a Possible Source of Error in X-ray Findings of the Normal Vertebral Column. A. O. Freedman. Can. Med. Assn. Jour., Jan., 1926, p. 44.

X-ray of the urinary tract. — The author discusses the general findings of the roentgenogram taken without catheters, the plain film taken with opaque ureteral catheterization, and that of the urinary tract when filled with opaque solution. His technic is that of a high milliamperage, 21-inch distance, target screen, and an exposure of from one-tenth to one-fifth second. Except for large patients the Bucky diaphragm is not used. Sheldon finds that some urologists prefer to inject the opaque solution under the fluoroscope that they may see the return flow in the ureters, while others do not use the fluoroscope at all. He reports a case of a female, 22 years old, single, referred to him to rule out opaque calculus, in whom no left kidney shadow could be found. Later cystoscopic and operative findings confirmed his diagnosis of congenital unilateral kidney. No left ureteral orifice could be found in the bladder. The case is reported because of its infrequency and to stimulate thorough investigation of both sides of the urinary tract before operation on a kidney is attempted.

X-ray of the Urinary Tract, with Report of a Case of Congenital Unilateral Kidney. Francis B. Sheldon. Calif. and West. Med., Dec., 1925, p. 1569.

Isolated radiation of blood.—The blood of dogs suffering from sarcoma of the vagina was irradiated by roentgen rays without treating the tumor itself. The authors inserted a paraffinized glass tube into the jugular vein and applied one S.U.D. on the blood passing the tube. The results were controlled by biopsy of the tumors. It was proved that the same histological changes as seen after direct radiation of malignant growths could be demonstrated. No bad effects were observed.

E. A. POHLE, M.D.

The Effect of Isolated Irradiation of the Blood upon the Cells. S. Fraenkel and L. Nitsniewitsch. Strahlentherapie, 1926, XXI, 3, p. 452.

Fractures of the femur.—A careful and detailed report of 111 cases of fracture of the femur treated during the past ten years by the authors.

These fractures are classified as: first, fractures through the neck, which are mostly or entirely intracapsular; second, fractures through the trochanters including (*a*) fractures at the base of the neck which are wholly or largely extra-capsular and usually impacted, (*b*) fractures causing partial comminution of the great trochanter and which, in their least serious form, are simply a more advanced grade of fractures at the base of the neck, while in their more serious forms they verge into (*c*) fractures involving both trochanters, usually with some comminution; third, fractures just below the trochanter; fourth, fractures of the shaft; fifth, fractures involving the knee joint (*a*) just above the condyles and (*b*) involving one or both condyles. Of the 111 cases, 11 per cent died (several from senility), while 89 per cent of the remainder were traced and constitute the basis of report of final results. Of these, 50 per cent had a good anatomic result (absolute reposition of fragments), 40 per cent moderate, and 10 per cent bad. Sixty-three per cent had good functional result (no impairment of function whatever), 30 per cent moderate, and 7 per cent bad. The improvement in these results as compared with reports of the previous ten years is striking. It is pointed out that in children under fifteen years of age a very bad initial relationship of the fragments, except in fractures actually involving either joint, is almost invariably followed by an excellent functional and good anatomical result under any accepted form of treatment, and, therefore, there is no indication for open operation in children, except possibly the involvement of a joint. In adults, this adaptive power is much less and it is much more important to replace the fragments accurately and promptly: much more so where the injury is near either joint than when in the shaft. Joint fractures, however, and especially those near the hip, usually may be accurately reduced without incision, either by position alone or by traction.

If operation is determined upon, it should be done promptly and only when the most skillful technic is possible. In this series, operative treatment was adopted only ten times, or in 9 per cent. Indications for operation are inability to secure or maintain sufficiently accurate reduction to ensure, first, bony union, and, second, absence of disabling deformity.

This is a long paper (40 pages) and only such points as would appear to be of direct in-

terest to roentgenologists have been included in this abstract.

CHARLES D. ENFIELD, M.D.

Prognosis and Treatment of Fractures of the Femur. A. P. C. Ashhurst and E. T. Crossan. Arch. Surg., Feb., 1926, p. 453.

Spinal condition similar to Pott's disease.—Two cases are cited, with radiographs, in which the body of a vertebra was markedly narrowed—with complete preservation of the cartilaginous discs on either side—without definite bone formation or calcium deposit until late in the disease.

1. In these two cases the lesion attacked only one vertebra (there is but one pedicle). The lamellar aspect of the osseous nucleus, regular in one case, irregular in the other, and slightly wedge-shaped, can be found in Pott's disease (especially in the lumbar region), but in Pott's disease there are always at least two pedicles, at least two of the vertebræ being affected or destroyed. This cuneiform shape always indicates the total destruction of the inter-vertebral disc.

2. In striking contrast here is the absolutely intact condition of the adjacent discs above and below the diseased vertebra.

3. The cartilage is thicker and there is a new formation of this tissue. The transparent part above and below the lamellar osseous nucleus is at least a third higher than it is normally. (This is never seen in tuberculosis, which is markedly destructive of cartilage tissue.)

4. Greater opacity is to be remarked, which indicates that the bone density has increased. This characteristic is especially noted in the observation of Case 2, but is also perceptible in Case 1.

This group of radiographic findings lead the author to believe that the condition described is similar to Legg's disease of the hip.

L. R. SANTE, M.D.

A Localized Affection of the Spine Suggesting Osteochondritis of the Vertebral Body, with the Clinical Aspect of Pott's Disease. Jacques Calvé. Jour. Bone and Joint Surg., Jan., 1925, p. 41.

Focal infections.—Focal infections in the upper respiratory tract are present in a sufficiently large percentage of cases of the psychoses and neuroses to warrant the assumption of a causal relationship between the focal infections and the disease conditions of the nervous system. Focal infections of and by themselves are probably the cause of the psychotic or psychoneurotic condition in only a relatively small percentage of cases. In the vast majority of cases, the focal infectious process acts on an already existing condition of under-nutrition, anemia, endocrine imbalance, etc. Focal infections appear to produce much more marked nervous symptoms and to produce them with greater frequency in individuals with arterial hypotension than in those with normal blood pressure or an arterial hypertension. This is probably an endocrine reaction.

W. W. WASSON, M.D.

The Influence of Focal Infections. D. J. McCarthy. Jour. Am. Med. Assn., Dec. 19, 1925, p. 1949.

Metastatic testicular carcinoma, treated by X-ray.—Teratoma testes are so often malignant, and when malignant are so prone to form metastasis, that we should keep any means by which their growth may be retarded, even when complete cure is impossible, fresh in our minds. Surgery alone is insufficient except in the earliest stages, and it is hopelessly inadequate when metastasis has occurred. Dr. Ullmann reviews the literature and reports one case of metastasis occurring eighteen months after removal of the right testicle which the pathologists had reported was teratomatous. Patient referred in June, at which time an attempt was made to put 90 per cent of the 100 per cent dose into all tumor areas. This was done in eight days. September 6, the patient returned for a second series, and 72 per cent of the first dose was given. Ten weeks later no tumor mass could be found, and on February 17 the record shows no evidence of tumor at any point. The man has been working full time since then, and a report of clinical cure is made. Fifteen months later he reported, with the same negative findings.

F. B. SHELDON, M.D.

Metastatic Testicular Carcinoma Involving the Abdominal, Mediastinal and Supra-clavicular Glands Treated with X-ray. H. J. Ullmann. Calif. and West. Med., Dec., 1925, p. 1579.

Barium meal in gall bladder and bile ducts.—This is an interesting report of a case, in which a barium meal backed up into the gall bladder and the bile ducts in the liver through a fistula made by the spontaneous perforation of a gallstone into the duodenum. There are excellent roentgenograms showing traces of the barium meal in the bile ducts twenty hours after the taking of the meal.

CHARLES D. ENFIELD, M.D.

Unusual Bile Duct Visualization by Roentgenograms of Barium Meal. Edwin Habbe and Lester A. Smith. Jour. Am. Med. Assn., Feb. 13, 1926, p. 476.

Pseudocoxalgia. — Legg, in 1909, was the first to give a description of pseudocoxalgia, and to isolate it as a definite clinical entity. The disease is by no means rare and numerous cases have been reported since. There are several diseases in other parts of the skeleton which cause changes similar to those of pseudocoxalgia:

1. Osteochondritis of the spine (Scheuermann); 2. Tarsal scaphoiditis (Köhler); 3. Osteochondritis of the heads of the second and third metatarsals; 4. Schlatter's disease of the epiphysis of the tibial tubercle.

L. R. SANTE, M.D.

Pseudocoxalgia. Thomas P. Noble. Jour. Bone and Joint Surg., Jan., 1925, p. 70.

Early rachitic changes. — The author discusses the theories as to the etiology of rickets, naming as causes, defective feeding, lack of sunshine and fresh air, insufficient amount of exercise, and parental influence. He also discusses the pathological changes occurring in the course of the disease, such as bent limbs, square head, rachitic rosary, etc. It is his belief that the X-ray plays a large part in the early diagnosis of rickets. For this, he takes from just below the crests of the ilii to include the feet, all on the same film. This will give not only the changes in the tibia and femur, but also the deformity. In the very early cases the changes are in the lower part of the femur and the upper part of the tibia: the whole joint has a hazy appearance; the shafts near the epiphyseal lines are clearer and more transparent than normal; there is a notable thickening at this point, and the epiphyseal lines are broader and not nearly so clearly defined as in the normal. Usually there is an increase of calcium deposited in the region of the epiphysis. Similar changes in the distal end of the tibia and fibula are generally less marked.

Chappel also discusses the treatment in these cases. In the discussion of this paper, William P. Lucas speaks of the lack of HCl in the gastric secretion as a possible etiological factor.

F. B. SHELDON, M.D.

Early Rachitic Changes in the Femur and Tibia. Halbert W. Chappel. Calif. and West. Med., Dec., 1925, p. 1581.

Skin cancer. — A detailed and instructive analysis of methods of treatment and results in a considerable series of superficial malignancies. The early cases showed 81 per cent of cures by radium alone; moderately advanced cases, 38.4 per cent, and advanced cases, none. In the early and moderately advanced classes, certain cases were treated by combined surgical and radium therapy, with additional cures amounting to 3 and 10 per cent, respectively.

The author concludes that radium is the treatment of choice in cases of cancer of the nose and eyelids, and that it is a perfectly satisfactory method of treating skin cancer in any location, although excision (presumably without radiation treatment) is satisfactory in situations where it will cause no deformity. His optimum method of treatment is the insertion of radon implants, using one millicurie to each cubic centimeter of tissue. He then uses steel jacketed radon tubes to destroy any remaining growth, employing 12.5 to 15 millicurie hours per area.

CHARLES D. ENFIELD, M.D.

End-results of Radium Treatment of Skin Cancer. Ernest M. Daland. Jour. Am. Med. Assn., Feb. 13, 1926, p. 471.

Intestinal diverticula.—The authors recognize three stages of diverticulosis of the intestine, as follows: 1. Prediverticular stage (in colon); 2. Quiescent diverticulosis; 3. Diverticulitis. Each stage passes by gradations into the next; indeed, all the stages may be present in the same patient. The writers stress three points: first, that diverticulosis is much commoner than has been recognized hitherto; second, that it is frequently associated with symptoms; third, that, contrary to the conclusions of nearly all writers on the subject, these symptoms are frequently amenable to treatment.

Diverticula may be found in each part of the alimentary canal, but they are most frequent in two regions. The first is the duodenum or jejunum. These pouches are large, up to the size of a walnut, or larger; often single, but there may be two, three, or—rarely—even more. The second region is the colon, from which small pouches arise, up to the size of a pea, seldom as large as a blackberry; these are usually multiple and sometimes very numerous.

If a careful routine examination of the duodenum is made with proper manipulations of the tube so as to get the different aspects of this part of the bowel into profile, no other special technic is needed.

Diverticulosis of the colon is common. It was present in 10 per cent of 1,000 radiologic examinations of the bowel. The "prediverticular stage," the first stage of diverticulosis, is recognized by noting that a part of the bowel wall, instead of showing its natural free curve of outline, appears fixed and contracted, with a profile of minute irregularities. This may be seen only on one side of the bowel, but if it involves the circumference, there is the appearance of a stricture. The second stage, formed diverticula, are

frequently seen as small pouches upon an otherwise normal-appearing bowel. The third stage, diverticulitis, is due to inflammation of a pouch or pouches. At first, the inflammation is limited to the wall of the bowel; later, surrounding tissues may be implicated, causing the formation of a tumor, which may lead to obstruction, and is frequently thought to be malignant. The X-ray appearance is characteristic. Instead of rounded pouches are seen palisade- or spike-like processes set at various angles to the lumen. They are the remains of the pouches squeezed to this shape by the edematous and inflamed bowel wall around them. They are rigid, whereas the neighboring haustra, not involved in the inflammatory process, are over-active, frequently changing their shape.

The authors are of the opinion that their discovery of the prediverticular stage alters the previous conception of the nature of diverticulosis. The pockets were thought formerly to be mere passive extrusions of mucous membrane through weak places in the bowel, particularly where the blood vessels pierce the wall, pushed through by internal pressure. They now believe, however, that there is a local irritation or inflammation of the bowel mucosa, the nature of which has as yet not been definitely determined, which weakens and thins definite areas of the colon, making these areas liable to herniation. The authors suspect a chronic infective process in the wall of the bowel. One of them has, further, noted that spondylitis, with liability to lumbago and fibrositis, was often found in patients with multiple diverticula. A comparative study of the spinal column of 100 non-diverticulous patients of the same average age (58 years) as the 100 diverticulous patients in this series, revealed arthritic changes in 20 per cent of the non-diverticulous and in 72 per cent of the diverticulous cases.

Further, apical granulomata of the teeth, present in 38 per cent of the non-diverticulous control patients, were found in 65 per cent of the diverticulous. In many other cases some established infective or septic condition was present, such as appendicitis, gallstones, or arthritis. No doubt the reverse often holds true. Septic absorption from diverticula may give rise to sepsis in other parts of the body.

The authors' treatment of diverticulous bowels consists in the employment of an anti-constipation lacto-vegetarian diet, the formation of a regular defecation habit, removal of all septic foci, exercise, the use of paraffin by mouth and rectal colonic douches. They usually douche the bowel with saline on alternate days for a few weeks. Such douches are given at low pressure, the douche bag being elevated not more than eighteen inches, and no more than one quart of solution being used. They believe the use of the so-called high or long tube to be futile. It nearly always curls up, and, if it did not, might be harmful. In nearly all cases the patient's symptoms were found to be amenable to this treatment.

SOLOMON FINEMAN, M.D.

Intestinal Diverticula. E. I. Spriggs and O. A. Marxer. Brit. Med. Jour., Jan. 23, 1926, p. 130.

Cecal stasis.—The object of this paper is to show that cecal stasis is a well defined clinical entity, and deserves recognition as such, and may be associated with certain pathological conditions which are amenable to surgical treatment. The author suggests the use of the term "cecal stasis" in preference to the variety of terms used in the literature. The multiplicity of such terms as pericolitis, typhlitis, cecitis, perityphlitis, false appendicitis, and membranous pericolitis is confusing and prevents concentration on the disease which they all more or less represent.

Congenital defects in the normal development of the gastro-intestinal tract, in the process of migration, rotation, descent, or fixation constitute a weakness which may, under extra strain, be the means of tipping the scale in favor of disease. The conditions which galvanize this potentiality into actual stasis are putrefactive processes from faulty diet and pathogenic processes produced by invading micro-organisms. The inflammatory process may be in the nature of an appendicitis or a perityphlitis. The final outcome of all these factors is an atonic distention of the cecum, with paresis of the cecocolic sphincteric tract, and a disturbance of the synchronous action between the latter and the ileocecal tract. Appendicitis often plays only a very subsidiary rôle, and appendicectomy alone will give but little relief from symptoms.

The clinical picture may present a variety of symptoms, simulating chronic appendicitis, peptic ulcer, cancer, and other abdominal diseases. The diagnosis must be made by a careful analysis of the clinical history, in conjunction with the use of the X-ray, using the opaque meal. (The opaque enema is, in the opinion of the reviewer, of even greater value.) The X-ray examination gives the most valuable information. It demonstrates ptosis, pericolic membranes, dilated cecum, and abnormal fixation.

The treatment is both prophylactic and curative. The prophylactic consists in treating malnutrition and correcting poor posture. "The débutante slouch," adopted as the fashionable posture in our growing girls of to-day, is strictured by the author. In early cases the treatment consists of rest in bed, meat-free diet, daily enemata, abdominal belt, proper exercise, and

attention to constipation. In advanced cases surgery is the only remedy. Removal of the appendix, with release of any constricting bands, will suffice. The more severe cases will require in addition plication of the cecum and ascending colon. Removal of the colon, once strongly advocated, should be reserved for the extreme cases.

L. J. CARTER, M.D.

Cecal Stasis. A. R. Munroe. Can. Med. Assn. Jour., Jan., 1926, p. 40.

X-ray treatment summary. — This paper gives a concise summary which should be of value to the radiologist in indicating to the profession what may be offered from X-ray treatment in disease.

In ringworm the X-ray offers the only known certain cure.

Sycosis and favus are cured by one epilation dose.

Chronic boils are cured with uniformity.

Hyperidrosis is relieved in six months, treatment being given once a month.

Psoriasis is made to disappear temporarily, but is apt to recur.

Keloid is much improved.

Warts drop out in three weeks after a large dose.

Rodent ulcer heals at the rate of an area the size of a quarter each month.

Lupus vulgaris is improved, but rarely cured.

Acne vulgaris is at first made worse, but clears up after six months.

Chronic eczema yields to one treatment; acute eczema should be treated once a week with half doses.

Superfluous hair on the face of a woman should not be treated by X-ray.

Nævus yields to treatment once a month, the number of treatments required being gauged by the reaction.

Uterine fibroids and uterine hemorrhage are treated with uniform success. The time necessary is about three months.

Enlarged thymus in a baby yields relief of symptoms in twenty-four hours.

Exophthalmic goiter should be treated every three weeks, and will yield results in two months.

Tuberculous glands are treated once a week and heal in three months.

Splenic leukemia is temporarily improved, but tends to relapse.

Lymphadenoma responds quickly.

Carcinoma should be treated by surgery, with pre-operative and post-operative X-ray deep therapy extending over a period of six months. Recurrences should be treated for a year. Some carcinomata do not respond. X-ray is the only treatment for recurrences and inoperable primary cases. It gives sufficiently good results to warrant its being used in all carcinomata.

The details of the treatment of each of the conditions above enumerated, and the dosage, are given in the paper.

L. J. CARTER, M.D.

A Résumé of the Therapeutic Value of X-rays. A. Howard Pirie. Can. Med. Assn. Jour., Jan., 1926, p. 54.

French and German R-units.—The French roentgen unit (Solomon) and the German *R*-unit (Behnken) are not identical; the relation between the two standards has been given as—

1 *R* (Behnken) = 2.25 *R* (Solomon), by Grebe and Martius, and

1 German *R* = 3 French *R*, by Kaplan.

Control measurements by the authors following Solomon's technic resulted in the equation:

1 German *R* = 2.66 French *R*.

E. A. POHLE, M.D.

Comparison between German and French R-units. Humberto H. Carelli and Friedrich Vierheller. Strahlentherapie, 1926, XXI, 3, p. 468.

Recidivation after radiation.—The authors discuss the recurrences in patients with uterine cancer (cervix and corpus) after combined radium and roentgen-ray treatment, based on the experience of the Seitz clinic. They report four cases of carcinoma of the cervix and five cases of corpus cancer which had been diagnosed microscopically before the radiation treatment. After periods ranging from seven weeks to seven months a radical operation was done to study the effect of the radiation of the tumors. The authors found that there is no direct relation between the doses and the result; some patients who had received relatively small doses did not show any cancer cells two months after the last treatment, while in others who had been heavily treated, abundant cancer cells were still present in the growth. It seems that factors still unknown to-day, as, for instance, the constitution, play an important rôle in the problem of cancer therapy. Although the cause of cancer is not discovered, radiation therapy can and should be used with success.

E. A. POHLE, M.D.

Uterine Cancer after Radiation Therapy. Alfred Stern and Oskar Bott. Strahlentherapie, 1926, XXI, 3, p. 426.

Kidney tumors.—The author asks the question, Is it necessary to make pyelograms to diagnose kidney tumors? He uses a technic of 20 ma., 20-inch distance, 10 seconds with 2½ to

3 inch gap, compression but no Bucky diaphragm for patients of less than 180 pounds. He makes his diagnosis from the size of the kidney shadow and reports four cases of tumor of the kidney made from the flat film only. Three were confirmed at operation and the fourth at autopsy.

F. B. SHELDON, M.D.

X-ray Diagnosis of Kidney Tumors. Mark Brown. Calif. and West. Med., Nov., 1925, p. 1435.

Cholecystography.—Dr. Boardman and Dr. McKenzie give the technic for the administration of the tetraiodophenolphthalein dye by the intravenous and oral methods. They have used the dye in 109 cases: in four the dye was given rectally, in thirty-eight by mouth, and in sixty-seven intravenously. Rectal administration was soon abandoned as the absorption was too uncertain. Of those receiving oral administration, seventeen gave normal shadows, eleven incomplete, and ten no shadows. Five of these were operated on; three from the no-shadow group and two from the incomplete. All showed definite gall-bladder pathology. Of the intravenous cases, fifteen were normal, twenty-six incomplete, and twenty-five no shadow. Fifteen of these were operated on, seven showing no shadow, seven incomplete, and one normal. In the last, there was a pathological appendix and but very slight changes in the gall bladder; the other fourteen showed definite gall-bladder pathology.

The authors conclude that this method furnishes evidence which in the majority of cases is more definite than that furnished by any other special method of examination of the gall bladder, namely, the direct and indirect evidence furnished by the routine barium meal, and the findings of the Lyon method. It is emphasized that no one method should be relied upon solely in making a diagnosis, but the findings must be correlated with the clinical study, history and physical examination.

F. B. SHELDON, M.D.

Cholecystography—Its Value as a Diagnostic Procedure. Walter W. Boardman and Roger B. McKenzie. Calif. and West. Med., Jan., 1926, p. 60.

Radium applicator.—An adaptation of the Sippy esophageal dilator to radium application is described. The olive tip of the dilator is guided into the lesion over a silk thread. The relative comfort to the patient with this form of applicator is emphasized.

CHARLES D. ENFIELD, M.D.

A Radium Applicator for Use in the Esophagus. John H. Fitzgibbon. Jour. Am. Med. Assn., Feb. 27, 1926, p. 622.

Fracture of acetabulum. — The article is based on a case report, with roentgenograms. Central fracture of the acetabulum, though rare, does occur with sufficient frequency to be thought of when a patient has fallen or has been thrown to the ground, as when struck by some vehicle (also in injuries which involve extreme direct pressure on the trochanters).

Luxation of the ischium may occur when the rim of the acetabulum, especially the posterior part, is broken off.

CHARLES D. ENFIELD, M.D.

Central Fracture of the Acetabulum. Samuel W. Boorstein. Jour. Am. Med. Assn., Feb. 27, 1926, p. 617.

Obstetrics. — Before proceeding to discuss the value of the X-rays, their possible deleterious action on the ovary should be considered. While it is possible to produce embryonic abnormalities by X-ray irradiation, this is true of only extensive and prolonged exposure, and does not result from the momentary exposure necessary to secure a radiogram.

The value of the X-ray is discussed in each of the three trimesters. In the first trimester the X-rays are used chiefly for the study of the pelvis. Some observers, however, have been able, by the use of pneumoperitoneal radiography and other methods, to demonstrate such diagnostic signs as enlargement of the uterus at the isthmus as early as the sixth to the tenth week of pregnancy.

In the second trimester a satisfactory picture of the fetal skeleton can usually be obtained. The paper of Stein and Arens is quoted, wherein it is stated that the earliest fetus visualized was thirteen weeks, and the average period for the visualization of the complete fetus was at mid-term.

In the third trimester of pregnancy the entire fetal skeleton can usually be demonstrated except in unusually obese subjects. Not only can the presenting part be determined but also the position of the fetus *in utero*. Attention is called to the possibility of changes in the presentation in the same patient at different times. One film showed a breech presentation, while two days later a second film showed the head presenting. The presence of twins, fetal abnormalities, disproportion between the size of the head and the inlet are among the things which the X-ray can portray. Fetal death has been diagnosed by this method, as manifested by the overlapping of the skull bones.

L. J. CARTER, M.D.

The Value of X-rays in Obstetrics. Ross Mitchell and M. R. MacCharles. Canadian Med. Assn. Jour., Dec., 1925, p. 1202.

Kidney stones. — A detailed analysis of a series of 164 cases is presented. The relative radiability of the various salts present in kidney stones is shown. The usual diagnostic (radiological) procedures are detailed. The use of dilute solutions of the pyelographic medium, specifically 3.5 per cent sodium iodide, is suggested as a means of obtaining a triple contrast between the stone shadow, the filled pelvis, and the kidney substance, and hence of permitting the accurate localization of the stone with regard to its position in the pelvis.

CHARLES D. ENFIELD, M.D.

Kidney Stone as a Diagnostic Problem. B. H. Nichols. Jour. Am. Med. Assn., Dec. 12, 1925, p. 1871.

Perforating ulcer. — Twenty-nine cases of acute perforation of gastric or duodenal ulcer examined pre-operatively for the presence of air free in the peritoneal sac constitute the material for this article. It is suggested that the patients be fluoroscoped on the stretcher *en route* to the operating room. No contrast medium is administered nor is there any special preparation. Presence of a gas bubble above the liver and below the diaphragm, in the sitting posture, or just under the anterior abdominal wall in the supine posture, confirms the diagnosis of perforation. It is pointed out that this is a far more accurate method of determining the presence of gas in the peritoneal cavity than the percussion method long emphasized in the diagnosis of perforation.

CHARLES D. ENFIELD, M.D.

Roentgen Ray in the Diagnosis of Perforated Peptic Ulcer. R. T. Vaughan and William A. Brams. Jour. Am. Med. Assn., Dec. 12, 1925, p. 1876.

Hilum tuberculosis. — A committee of the American Sanatorium Association (1922) describes hilum tuberculosis as a condition giving a positive von Pirquet reaction and characterized, with more or less constancy, by frequent colds, cough, hoarseness, fatigue, anorexia, subnormal weight, occasional unexplained elevation of temperature and other general symptoms of this type; and by paravertebral dullness, usually without other physical findings in the chest and by the following roentgen-ray signs: first, prominent bronchial trunks, with beading; second, enlarged lymph nodes in the hilum, and, third, diffuse shadows of varying density throughout the hilum.

The present article is based on a study of 2,285 cases, of which 1,176 had positive von Pirquet reaction. Tables are given showing the incidence of symptoms in both groups. In the ones in which a definite diagnosis of hilum tuberculosis was finally made, numbering 277, 57 per cent were diagnosed on a combination of roentgen-ray evidence, physical signs and symptoms, 20 per cent on roentgen-ray evidence and symptoms, 18 per cent roentgen-ray evidence and physical signs, and 4 per cent roentgen-ray evidence alone.

A scheme of classification of hilum shadows in children who react to the tuberculin test is given.

With regard to roentgen-ray evidence, the author states that the most frequent finding is a moderately thickened hilum, showing shadows interpreted as glands. Special emphasis is placed on beading of the trunks running outward from the hilum and on the occurrence of circumscribed areas of increased density in the lung parenchyma.

CHARLES D. ENFIELD, M.D.

Hilum Tuberculosis: Relative Value of Symptoms, Physical Signs, and Roentgen-ray Findings in the Diagnosis of Bronchial Gland Tuberculosis. David Zacks. Jour. Am. Med. Assn., Feb. 27, 1926, p. 598.

Malignant granuloma.—The author records the results of X-ray treatment of 19 cases of malignant granuloma, 11 in women and 8 in men. The ages ranged from 8 to 49, the average being 29. Apart from purely symptomatic treatment no therapeutic measures were employed. The results were as follows: The average duration of life and good health was considerably prolonged.

Voorhoeve points out that it is essential that all the localizations of the process should receive a sufficiently large dose, and that any recurrence should be treated at once. He frequently observed that a few hours after the first application of X-rays, especially when there was a sudden and considerable absorption of the granulomatous tissue, there was a rise of the already elevated temperature, which subsided in one or two days, when an improvement of the general condition and a fall of temperature occurred. Leukopenia in patients under treatment might reach a considerable degree without any permanently bad effect resulting. The lowest number of leukocytes found was usually between 3,000 and 5,000. The prognosis was unfavorable in cases where the malignant granuloma was situated in the lung or abdominal lymphatic glands, in cases of pleural effusion, and in those complicated by diffuse tuberculosis of the lymphatic glands.

X-ray treatment is contra-indicated in the following conditions: Association with pulmonary tuberculosis when the malignant granuloma is

situated in the mediastinum or lung, amyloid disease, multiple metastases in the bone marrow, and acute infective processes in the neighborhood of the malignant granuloma.

X-ray Treatment of Malignant Granuloma. N. Voorhoeve. Nederl. Tijdschr. v. Geneesk., Oct. 10, 1925, p. 1677. (Reprinted by permission from Brit. Med. Jour., Feb. 20, 1926, p. 35 of Epitome of Current Medical Literature.)

Bone sarcoma.—After complete canvass of the individual members of the American College of Surgeons and all other available agencies, after five years, only 17 cases of primary malignant bone tumors have been collected, which, in the author's opinion, may be considered cured: four cases of the type of Ewing's tumor, and 13 cases of osteogenic sarcoma. Large numbers of the cases reported were found on close analysis to be secondary tumors—in Codman's own case the tumor at autopsy was found to be due to secondary carcinoma, not to primary sarcoma at all. How, then, can the diagnosis be made?

PART I. TWENTY-FIVE CRITERIA FOR ESTABLISHING THE DIAGNOSIS OF OSTEOGENIC SARCOMA

Nearly all histories of osteogenic sarcoma cases conform to the following five points:

HISTORY: (1) *Onset.* The onset is with pain before tumor is noted. History of preceding trauma. Pathological fracture very rare at onset of disease in osteogenic sarcoma. We may say, therefore, that unless pain precedes other symptoms we may suspect that the case is not one of osteogenic sarcoma.

(2) *Duration.* If the patient sought advice in less than a month or over a year from the onset of symptoms, one may suspect that the case is not one of osteogenic sarcoma. The pain is at first bearable, but its present inevitability brings the patient to consult a doctor after a time.

(3) *General Condition of Patient.* Unless the patient is considered to be in good health just before the onset, we may suspect the case is not one of osteogenic sarcoma. The author concurs in Ewing's belief that sarcoma is a result of failure to inhibit normal repair processes, which condition exists in some individuals.

(4) *Age.* In any patient over 50 years of age, who does not have Paget's disease, we may suspect the case is not one of osteogenic sarcoma. The incidence of osteosarcoma occurring as a result of Paget's disease is given as from 12 to 14 per cent.

(5) *Rapidity of Growth.* We may suspect that a case is not one of osteogenic sarcoma if the enlargement has been noticeable day by day or week by week, or has not been noticeable month by month. Osteogenic sarcoma as a rule shows steady enlargement, practically always noticeable in a month.

EXAMINATION: (1) *Immobility of Soft Parts.* We may suspect that a case is not one of osteogenic sarcoma if clearly there is mobility of the soft parts over the tumor. Due to growth of large blood vessels the soft tissues over the sarcoma are not free.

(2) *Location.* The situation of the tumor may make us suspect that it is not an osteogenic sarcoma if it is not in one of the known usual locations, and the suspicion is in inverse proportion to the frequency of occurrence at its site. One-half of all osteogenic sarcomas occur in the femur, one-fourth in the tibia, and one-half of the remainder in the other long bones. Sarcoma rarely occurs in the shaft of a long bone; Ewing's tumor always originates in the shaft. The phalanges seem to be exempt.

(3) *Inflammatory Signs.* Unless the signs of inflammation are absent or very mild, we may suspect that the case is not one of osteogenic sarcoma. Typical osteogenic sarcoma does not present the signs of inflammation in its early stage; nevertheless, nearly all cases are diagnosed as osteomyelitis.

(4) *Condition of Neighboring Joints.* In a case in which there is not a considerable degree of free motion on the adjacent joints, we may suspect that the tumor is not an osteogenic sarcoma. Joint cartilage seems to act as a barrier to both benign giant-cell tumor and osteogenic sarcoma.

(5) *Size and Shape.* If a tumor is not of considerable size or if it is pedunculated, one may suspect it is not an osteogenic sarcoma.

X-RAY EXAMINATION: (1) *Combined Central and Subperiosteal Involvement.* A little cuff of reactive bone of trumpet shape, which surrounds the upper limit of the tumor, appears in the X-ray as a triangular space on each side of the shaft under the uplifted periosteal edge. The presence of this is a sure indication of subperiosteal extracortical involvement. It represents the last line of defence of normal osteoblasts retreating in circular formation as the tumor advances under the periosteum; the same phenomenon sometimes occurs as the result of inflammation. Benign tumors are either inside or outside the old cortex; malignant are both. We may, therefore, suspect that it is not a case of osteogenic sarcoma when the X-ray does not show both medullary and subperiosteal involvement.

(2) *Presence of Old Shaft.* If the X-ray does not show the old cortex or fragments of it in normal position, we should suspect that the case is not one of osteogenic sarcoma. In osteogenic sarcoma the perforation of the cortex seems, as a rule, to be transverse from within outward,

and if new bone formation occurs it follows these radiating lines.

(3) *Invasive Character.* A sharp line of the tumor against spongy bone may make us suspect that we are not dealing with osteogenic sarcoma. The advancing edge of these tumors in spongy bone is never rounded and smooth, as is the case in giant-cell tumors.

(4) *Osteolytic or Osteoblastic or Both.* Unless the X-ray shows that the tumor is both osteolytic and osteoblastic, or unless it shows it to be wholly one or the other, suspicion that it is not a case of osteogenic sarcoma is aroused. Evidence of radiating lines of bone formation are usually characteristic, but are not invariably present.

(5) *Involvement of Soft Parts.* A tumor which does not, on the X-ray, show either invasion of the soft parts or the reactive triangle, is perhaps not an osteogenic sarcoma. The active invasion of the soft parts by the tumor may be impossible of determination from the X-ray.

MICROSCOPIC CRITERIA: (1) *Mitoses and Hyperchromatism.* The finding of numerous mitoses in a bone tumor does not necessarily indicate osteogenic sarcoma, but absence or infrequency of mitotic figures should arouse the suspicion that the case is not one of osteogenic sarcoma.

(2) *Pleomorphism.* Any bone tumor which does not show pleomorphism is probably not an osteogenic sarcoma.

(3) *Tumor Giant Cells.* This criterion is not universal, but we may say that its presence on an osteogenic tumor is a very reliable sign of malignancy; yet its absence need not make one suspicious either of a malignancy of the tumor or of its place in the osteogenic series. Tumor giant cells vary in appearance from foreign body giant cells.

(4) *Differentiation.* In an osteogenic tumor, very complete differentiation or almost none is better than incomplete differentiation, and the evidence of quite complete differentiation should make us suspect that the case is not an osteogenic sarcoma, but a benign osteogenic tumor. Ewing's tumor, which may be simply an undifferentiated type of osteogenic sarcoma, has, nowadays, with radiation, a better prognosis than a relatively well differentiated chondro-type.

(5) *Tumor Vessels (vascular arrangement).* The author's personal conviction is that every osteogenic tumor shows tumor vessels, and that a tumor which does not show them in several sections is not an osteogenic sarcoma.

GENERAL CRITERIA: (1) *Nature of Pathological Examination.* Histological reports, even by excellent pathologists, on small and imperfect exploratory specimens should not be accepted unless in agreement with other important criteria.

(2) The quality of the data has much to do with a correct diagnosis.

(3) *Unanimity of the Different Specialists.* Any hospital familiar with work on bone tumors will promptly diagnose cases of bone sarcoma independently in each department.

(4) *The Registry Classification.* Expert opinion would not be expert opinion if, as a rule, it were capable of proof.

(5) *The Ultimate Result.* This factor is of greatest importance. If a case diagnosed bone sarcoma does not die within five years with metastases in the lungs, all criteria should again be scrutinized with the greatest care.

The thirteen cases of five-year cure of osteosarcoma are reported in detail.

L. R. SANTE, M.D.

Registry of Bone Sarcoma. E. A. Codman. Surg., Gynec. and Obst., March, 1926, p. 381.

Effect of roentgen rays of various wave lengths.—The old problems as to whether roentgen rays of various wave lengths have different biological effects, and the quantitative relation between the intensity of radiation and the biological effectiveness have been the object of the author's research. He employed two methods, the iontometric (chambers of various diameters and materials) and the biological method (*Vicia faba equina, Juengling*). He comes to the following conclusions:

(1) Making intensity measurements with ionization chambers of various sizes and very large diameters, to avoid the so-called wall effect, and calculating the results in energy units, lead to the confirmation of the investigations of Friedrich.

(2) The same intensity measurements done on sprouts of *Vicia faba* and *Ervum lens*, demonstrate different biological intensities when applying doses electrically equal. Scattered radiation has no influence on this result.

(3) The biological intensities increase usually with increasing wave length, while extreme long waves of X-rays show a decreasing effect.

(4) The differences between intensities measured biologically and electrically are much smaller when using small ionization chambers.

(5) If two radiations of the same effective wave length but of different compositions are used, the higher biological effect will always be caused by that radiation which extends over a wider range of wave length.

(6) It is probable that the biological effect corresponds to the number of absorbed electrical carriers.

In an appendix to the paper, the difference between the effect of radiations of long and short wave lengths is discussed, and it is stated that

there are certain experimental facts which support the assumption of such a difference. If silver ions (by iontophoresis) are added to the bean sprouts, their growth is inhibited; if they are also irradiated, a summation of the effect takes place. A certain latent time will always elapse before the X-ray effect will manifest itself.

E. A. POHLE, M.D.

Air Electrical and Biological Effect of Roentgen Rays of Various Wave Lengths. M. Bolaffio. Strahlentherapie, 1925, XX, 673.

X-ray examination of gall bladder. — The author describes his method of examining the gall bladder radiologically. After purgation the patient is given 5 grams of tetraiodophenolphthalein sodium or 3 grams of tetrabromphenolphthalein sodium dissolved in 40 c.cm. of distilled water and boiled for twenty minutes. The intravenous injection of this solution should be spread over ten to fifteen minutes. The preparation may be given by mouth, 0.1 gram for each kilogram of body weight, but the result is said to be less satisfactory, as some of the dye passes through the intestine. After fourteen to eighteen hours the patient is X-rayed and a shadow of the gall bladder will be seen. A faint shadow suggests partial obstruction of the ducts, while a mottled appearance indicates the presence of stones. A completely negative picture—that is, the absence of any shadow—points in most cases to a stone in the duct or a severe degree of inflammation. There is a possibility of error, however, and Baetzner mentions four cases in which, on the strength of a negative film, the patients were operated on and were found to possess healthy gall bladders. Two proved to be cases of acute pancreatitis, one of acute appendicitis, and one of spastic colitis.

Radiography of the Gall Bladder. W. Baetzner. Med. Klin., Jan. 2, 1926, p. 18. (Reprinted by permission from Brit. Med. Jour., Feb. 20, 1926, p. 35 of Epitome of Current Medical Literature.)

Foreign body in the lung. — Attention is called to a class of cases of chronic lung suppuration from the presence of endobronchial foreign bodies. The purpose of this paper is not so much to call attention to the bronchoscopic features, as to point out the high percentage of successful results in relieving the pathological process by removal of the foreign body. The prompt recovery even where very extensive lung suppuration is present, after the removal of very small foreign bodies from the tributary bronchus, is almost amazing. More remarkable is the fact that even though years have intervened the lung will be restored and again resume normal function. Over a hundred such cases where suppurative processes of long standing have ultimately become normal, have proven that it is not a chance observation. Lung suppuration from other causes does not clear up in this way. Pneumonitis of the diffuse spreading suppurative type and sloughing gangrenous processes do not occur as result of foreign body aspiration. Actual lung destruction with cavity formation and fluid level have not been encountered in any case of foreign body aspiration at the clinic. The pathological process seems to be more of a hyperplasia than a liquefaction of tissue—this may explain the rapid recovery after removal of the foreign body.

CLASSIFICATION OF FOREIGN BODY SUPPURATION

There is a marked contrast in two groups of substances likely to produce suppuration if aspirated: (1) Vegetal substances; (2) Other substances.

Likewise, suppuration is closely associated with the mechanical condition in degree and kind of obstruction:

(1) By-pass valvular obstruction, permitting a diminished quantity of air to pass in and out, resulting in diminished ventilation and impeded drainage.

(2) Check-valve obstruction, in which the air can get in but its escape is hindered. This produces obstructive emphysema on the involved side.

(3) Stop-valve obstruction, in which the bronchus is completely closed.

A peanut kernel or other vegetable substance is very apt to set up serious suppurative processes. Metallic foreign bodies are apt to give few if any symptoms for a long time after aspiration and then the symptoms may be very mild. Numerous case reports and radiographs are included to illustrate the points of the paper.

L. R. SANTE, M.D.

Suppurative Diseases of the Lung Due to Inspirated Foreign Body Contrasted with Those of Other Etiology. Chevalier Jackson. Surg., Gynec. and Obst., March, 1926, p. 305.

Psyche and roentgen therapy.—The author emphasizes the great importance of the general care for a patient under X-ray therapy. It is not sufficient to administer the required exposure, but the psyche must be considered. The strictly individualized procedure will give us the best end-result. This is very well explained in cases of sterilization by roentgen rays (symptoms of the menopause). The after-care should also be attended to on the same principle.

E. A. POHLE, M.D.

On the Relations between Psyche and Roentgen Therapy. E. Vogt. Strahlentherapie, 1925, XX, 1, p. 84.

Cervical spinal caries. — The authors state that the pharynx, larynx, and trachea form, in profile, in a skiagram a clear column, easily visible in front of the vertebral column. This is displaced forward when an abscess due to cervical caries is present, and constitutes a simple means of diagnosis which is a valuable sign in some cases where there are no clinical signs of abscess. Occasionally, subsequent skiagrams show regression of the abscess. The relations of the "clear column" with the cervical spine indicate also the best route for its evacuation. In one case of compression of the esophagus and trachea of uncertain origin, the skiagram showed displacement of the soft tissues, and indicated indirectly the presence of an abscess.

Radiographic Diagnosis of Cervical Spinal Caries. E. Sorrel and G. Mauric. Jour. de Radiol. et d'Electrol., Nov., 1925, p. 497. (Reprinted by permission from Brit. Med. Jour., Feb. 20, 1926, p. 35 of Epitome of Current Medical Literature.)

Gastric ulcers.—In a previous article the authors have reported a series of ulcer cases, which, under medical treatment, showed relief of symptoms. When checked by repeated roentgenographic examinations a number of patients showed diminution of the niche. In specimens resected at operation they were able to show by both gross and microscopic methods several cases of healing duodenal ulcer. At this time both duodenal and gastric ulcers have been demonstrated as healed after medical treatment. They comment that the duration of the healed period is problematical and state that they believe that a certain periodicity exists in the healing and re-establishment of peptic ulcers.

L. R. SANTE, M.D.

The Healing of Gastric Ulcers. Burrill B. Crohn, Samuel Weiskopf, and Paul W. Aschner. Archiv. Int. Med., Feb. 15, 1926, p. 217.

Rays emanating from cod liver oil.—During the past two years the author has performed a number of experiments to discover a substance that could be injected into a tuberculous abscess cavity and exert an antiseptic action on the causative bacilli. The best results have been obtained with cod liver oil. As this substance is too acid to be tolerated by the healthy tissues, it must first be boiled with an equal quantity of an aqueous suspension of magnesium hydroxide; the mixture is then centrifuged, and the supernatant fluid, which contains the oil, is removed. In this form it may be introduced into an abscess cavity without causing irritation. The success that has followed the evacuation of tuberculous abscesses and replacement of the pus with this oil has led the author to inquire into the manner in which it acts. Campbell and Kiefer found that cod liver oil exerts a bactericidal effect on virulent strains of tubercle bacilli. Kugelmass and McQuarrie showed that the oil possesses the property of emitting ultra-violet rays. An attempt to confirm the latter statement has cast doubt on the ultra-violet nature of the rays. An X-ray film enclosed in black paper and placed over a metal dish containing cod liver oil, when developed after forty-eight hours, was found to have a perfect representation of the oil upon it; rays must have emanated from the oil to affect the sensitized film. It seems probable that these rays are not of one type, but are composed of different wave lengths.

Treatment of Surgical Tuberculosis. G. B. Rhodes. Jour. of Lab. and Clin. Med., Dec., 1925, p. 227. (Reprinted by permission from Brit. Med. Jour., Feb. 20, 1926, p. 34 of Epitome of Current Medical Literature.)

The thymus.—A thymic death is one of the supreme tragedies of surgery. An apparently healthy child dies during the administration of an anesthetic during or after an uncomplicated tonsil and adenoid operation or during such a simple operation as circumcision. At autopsy the condition known as status lymphaticus is found; that is, there was an enlarged thymus and hypertrophy of all the lymphoid structures of the alimentary canal. Many maintain that there is no such condition as status lymphaticus. It is becoming more and more probable that a so-called thymic death bears no relation to the state of the gland, the gland simply sharing in the generalized hypertrophy of the lymphoid structures of the alimentary canal.

Following the thymic death of a child operated on after etherization, it was made a routine practice in the Throat Department of the Massachusetts General Hospital to X-ray the chest of all children from one to sixteen years of age before tonsil operations. All children showing a broad superior mediastinum were considered as suspicious thymus cases and were given four X-ray treatments of a third of an erythema dose, the treatments being repeated at intervals of ten days. The total number radiographed was 2,344; of these, 185 (or 7.5 per cent) showed a positive thymus shadow. Of these positive cases, 110 cases were treated and successfully operated on for tonsils. Ninety per cent of those treated showed a diminution of the thymus shadow.

A series of nearly five thousand cases radiographed showed that 7 per cent of the children in the tonsil and adenoid age (2 to 16 years) had an enlarged thymus.

The crying of a child during X-ray exposure

does not, as is commonly believed, enlarge the size of the thymus.

In a review of twenty-four articles on the physiology of the thymus, based mainly on animal experimentation, these conclusions were drawn: (1) The thymus is not necessary to life; (2) Thymectomy has no effect on the growth and development of the skeleton and organs; (3) Castration delays the involution of the thymus; (4) A substance contained in the thymus, when injected, causes convulsions; (5) In birds a relationship exists between the thymus and the egg-producing mechanism.

It is now commonly admitted that the possibility of an enlarged thymus should be considered in all obscure childhood respiratory embarrassments, and that a check of all such cases by radiography is definitely indicated. Also, the use of radiography directed toward thymus diagnosis prior to all childhood operative procedures, is now generally acceded to be a wise protective measure.

B. C. CUSHWAY, M.D.

A Clinical and Pre-operative Study of the Thymus in Children of the Tonsil and Adenoid Age. Harris P. Mosher, Alexander S. Macmillan, and Frederic E. Motley. Laryngoscope, Jan., 1926, p. 1.

Ollier's disease. — Cartilaginous tumors of bone are frequently encountered, but the type of irregularity of ossification of cartilage is not so well known. Ollier, in 1898, reported one case and the disease has since been called "Ollier's disease." His short definition of dyschondroplasia is as follows: "An affection of the period of growth with arrest of growing parts of the skeleton, with nodosities and swellings of the extremities of the corresponding long bones, curving of diaphyses, and slight but constant deformities of the hands." The author believes that the exostoses and dyschondroplasia were identical. In 1900, Molin, working under Ollier, published two additional cases. The condition is characterized by irregularity and retardation of ossification at the epiphyseal cartilage, for this cartilage does not submit to the normal process of ossification but persists as cartilaginous masses and nodules which take a long time to transform themselves into bone. The nodules may be periosteal or medullary. The process may be present in one extremity only, or upper and lower on the same side may be involved. One instance is recorded of one arm and the opposite leg—the cause is not clear. The roentgenogram shows the deformed contour of the bones and cartilaginous masses interrupted by dense white spots. Cole's study resulted in the following conclusions:

1. "Ollier's disease" is a term which seems fixed in the literature but which should be used only to designate those cases of cartilaginous dystrophy, with or without cartilaginous tumor or exostosis formation, which show an asymmetrical involvement of the body as the outstanding clinical feature.

2. Chondrodysplasia (a term preferable to "dyschondroplasia") is a condition which is usually asymmetrical but as several symmetrical cases are on record the term must, therefore, be broader in its application than "Ollier's disease." The gradation of reported cases between those of frank multiple cartilaginous exostoses on the one hand and the so-called chondrodysplasia with no change in anything but the internal architecture of the bones (Voorhoeve's cases) on the other, is so varied and irregular that a definite classification of cartilaginous dystrophies is still impossible. The possibility that the apparently widely different findings in some of these cases are only manifestations of different stages of the same condition must not be overlooked.

Several cases are reported in detail and the article is profusely illustrated with photographs and roentgenograms.

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Chondrodysplasia. Wallace H. Cole. Surg., Gynec. and Obst., March, 1926, p. 359.
